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COMMUNICATIONS

THE MIDDLE EAST ADAPTOMETER*

BY

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A LARGE number of instruments for the investigation of dark adaptation or the detection of night blindness have been described by different observers and are in use. It is not the object of this note to add unnecessarily to the number.

The adaptometer described in this communication was devised at the request of the Army Medical Service in the Middle East in 1941 partly because no such apparatus was available at the time or could be copied from published descriptions as the necessary materials were not available in Egypt, and partly to meet certain specified conditions. I have to thank Brigadier C. W. Graham, at the time Ophthalmic Consultant, for his help and advice.

The requirements were that the apparatus should be light and portable, that it could be used in a tent or generally where no dark room was available, that it should be sufficiently simple in construction and working to ensure that reliable results could be obtained by Medical Officers with no special training or scientific knowledge of the subject, and lastly that it could be constructed reasonably cheaply from materials obtainable locally.

The primary purpose of the apparatus was to test the limits of dark adaptation in the considerable number of men complaining of night blindness and later to determine whether the night vision

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of men on special duties, such as night driving, was sufficiently good.

The adaptometer, shown in Fig. 1, consists of three parts:—the observation (testing) chamber A, the lantern B, and attached in front of B, a device for varying the intensity of the illumination, the reducer, e.

DESCRIPTION. Fig. 1. The apparatus resembles in many respects that described by A. M. Thomson and others, which was used by them in the study of dark adaptation as an index of an adequate vitamin A in-take. The external dimensions and construction, the use of an opal glass at a distance of 33 cms. from the eyes of the subject, and the test objects used, are taken from the description of the Rowatt Institute apparatus, as is the use of a 6-volt lamp

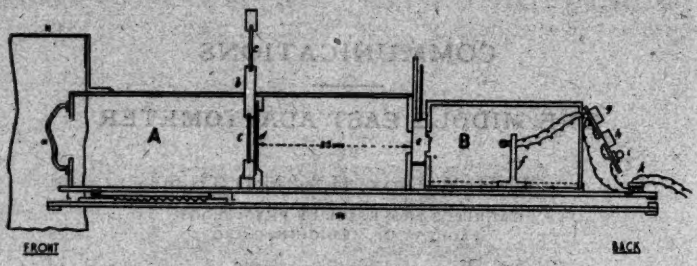

FIG. 1.—Side view section of Adaptometer.

A. Testing chamber; B. Lantern; *a*. Visor; *b*. Slide carrier; *c. c*. Slides; *d*. Opal glass screen; *e*. Reducer; *f*. Lamp-holder, 6 watt lamp; *g*. Voltmeter; *h*. Variable resistance; *k*. Switch battery connection; *m*. Base board; L. L. Support and rack for adjusting height; N. Black curtains for excluding light.

with a 5-volt current. The method of assessment of dark adaptation, the procedure adopted, and the calibration of the instrument, differ.

The *observation chamber* is a wooden box 55 cms. in length, 22 cms. in width, and 15 cms. in height (external measurements). At one end is a visor (*a*) carefully shaped and the edge well padded to fit the upper part of the face and bridge of nose of the subject with a corresponding aperture in the end of the chamber. At this end is a support (see Fig. 1) carrying curtains of black material which hang on either side of the subject's head and can be, if necessary, pinned under his chin to exclude extraneous light if the visor is not a good fit.

If the adaptometer is to be used in a lighted room the form of the visor is of great importance. The form I have found most satisfactory is in shape similar to that of the visor made in bent wood of the old fashioned hand stereoscope. It should be made of bent metal perforated at the edge for attachment of the resilient packing; this is made of either thin ¼ in. rubber tubing or cotton wadding covered loosely with black velvet or plush. The dimensions are from right to left covering both eyes 5½ in., depth at sides 3 in., between frontal edge and bridge of nose contact 1¾ in., depth at bridge of nose 1 in.

At the other end of the box is a centrally placed aperture through which light is admitted from the opal glass diffuser plate of the reducer. This plate is in close contact with the end of the chamber, when the lantern is in position for a test.

At 25 cms. from the lantern end is an opal glass screen (*d*) the flashed opal surface being in front. The free surface of the screen within its mounting is 10 cms. square. It is about 33 cms. from the subject's eyes.

Through a slot in the roof of the box immediately in front of the screen (*d*) a lantern-slide carrier (*b*) holding two slides (*c*) and (*c*) can be introduced. The clear glass slides carry figures in black such as a capital *E* or a numeral, the figures being 4 cms. high. The illuminated area of the slide visible to the subject is 7 cms. square. The slide-carrier can be taken out and reversed or inverted to show a new figure. A subject can thus be tested with 4 different images.

The board forming the floor of chamber (*A*) is extended backwards to carry the lantern (*B*) and is hinged to a base board (*m*) 1 metre in length, so that the visor can be adjusted by the support and rack (*L*) to the sitting height of the subject.

With some of the instruments was issued a small table 90 cms. long and sufficiently wide to allow the subject to rest his forearms, on either side of the chamber. The adaptometer can, of course, be used on any table of such a width so that the subject can sit at the visor end and the observer at the lantern end.

The Lantern B, in Fig. 1 (*See also Fig.* 4). This is a wooden box 25 cms. in length and 14 cms. in width and height. It contains a lamp holder carrying a 6-watt lamp. The right side opens on hinges to permit of adjustment of the lamp. The lamp holder (*f*) (Fig. 1) is held by guides *D* (Fig 4) between which it can be moved along a millimetre scale for the exact adjustment of the distance of the lamp filament from the front surface of the opal glass diffuser plate of the reducer. (For the lamp holder *f* see (Fig. 1) and *A* (Fig. 4)).

To the front of the lantern case is attached the light reducing device *e* (Fig. 1) and to the back an instrument panel at a convenient inclination. On this are mounted a voltmeter *g*, a variable resistance *h*, and a switch *i* (Fig. 1). The voltmeter is connected across the lamp terminals. On the base board is a plug *k* (Fig. 1) through which the current for a 6-volt accumulator can be plugged in.

Wiring.—A connection is made from one pole of the plug (*k*) to the moving arm of the rheostat (*h*). From the terminal of (*h*) the current passes to one of the terminals of the lamp voltmeter. The other pole of the plug is connected to the switch (*i*) from which the connection is made to the other lamp terminal (Fig. 1).

The Reducer (*Figs.* 2 *and* 3).—The variation of the intensity of the illumination is effected in two ways:—

(i) The full aperture being 20 mms. diaphragms of 5, 2 and 1 mm. diameter are provided (Figs. 2 and 3B).

(ii) The light passes through two polaroid discs (*C* and *D* in Fig. 2). *D* is fixed. *C* can be turned through an angle of 90°, so that starting at zero with the axis of the two polaroids at right angles, any desired percentage increase of the light can be obtained.

Description.—The reducer (made of metal or vulcanite) is built

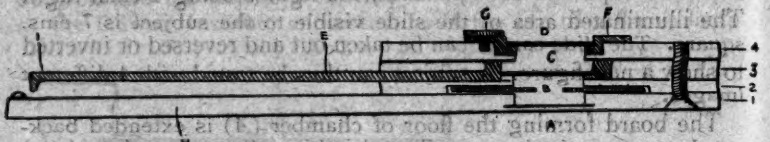

FIG. 2.—Section of Light Reducing Device.

1. 2. 3. 4. Component sections from before backwards; A. Opal glass diffuser plate; B. Diaphragm quadrant; C. Movable polaroid disc; D. Fixed polaroid disc; E. Seating of polaroid C; I. Indicator arm of same; H. Extension upwards of sec. 1 to carry reducer scale; F. Seating of polaroid D; G. Fixing screw of same.

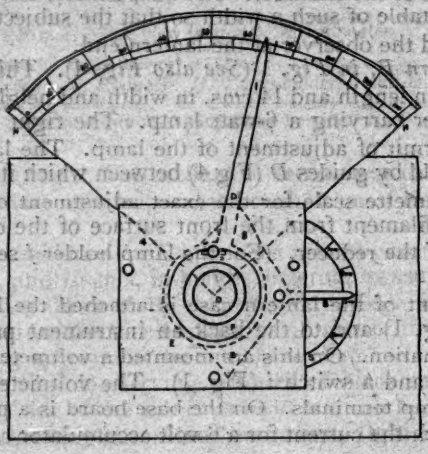

FIG. 3.—Back view of Reducer as attached to front of Lantern.

Lettering the same as in Fig. 2.

B. Diaphragm quadrant; B. Indicator arm of same; S. Scale; D. Fixed polaroid disc in seating F and fixing screw G; E. Mounting of movable polaroid with indicator arm I; H. H. Scale showing percentage decrease in illumination.

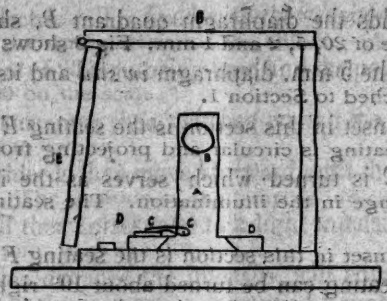

FIG. 4.—Section through Lantern at level of Lamp holder.

A. Lamp holder; B. 6 watt lamp; C. C. Pointer traversing millimetre scale; D. D. Guides between which lamp holder slide; E. Hinged side door for adjustment of lamp position.

up of four sections (1, 2, 3 and 4 in Fig. 2) 10 cms. square and 0·5 cm. thick.

Section 1.—Inlaid on the front surface of this is an opal glass plate A flashed on the front surface (the " diffuser "). The opal plate covers a centrally placed aperture 20 mms. in diameter.

This section is extended upwards to carry the scale showing the percentage change in the intensity of the light produced by the turning of the polaroid disc *C*.

Footnote.—To avoid considerable error, especial care must be taken in regard to three different factors.

(i) The zero point of the lamp scale. This is the point at which the lamp filament and the front surface of the diffuser would be in contact. It is determined after assembly of the reducer and attachment to the lantern by measuring with micrometer calipers the distance of the front of the diffuser from the lamp filament with the lamp in its most forward position. At its base the lamp holder carries a pointer which traverses the millimetre scale.

For example, it was found in one apparatus by careful measurement that the lamp filament was 28 mm. distance from the diffuser surface; the millimetre scale was then fixed with the pointer at 28 mm., on the scale, the zero point being thus correctly placed. Any measured point on the scale to which the lamp is moved will then give the distance of the filament from the diffusing surface.

(ii) It is essential that the diaphragm aperture shall be exact. In the case of the 1 and 2 mm. diaphragm the diameters must be verified under the low power of a microscope with the eye piece micrometer, and any error corrected.

(iii) The two polaroid discs must be in correct position. This is best done by superimposing the two discs before mounting and turning to the position at which least light passes. A line in a corresponding position on the periphery of each is made in ink. When cementing in, the line on one must correspond to the centre line of the indicator arm of seating E and on the other to the fixing screw G of seating F. The exact adjustment is made, as described above, after assembly.

Note.—I have to thank Major C. Cockburn for helping me to test out the apparatus on a number of subjects at No. 15 General Hospital and later for an account of the results he obtained at No. 6 General Hospital at Tel el Kebir: and Major H. H. Aitchison for his report on the use of the adaptometer at No. 9 Hospital.

I also have to thank Professor Rosgyll Ayres of the Physics Dept. of the Fuad I University Cairo for the information given regarding the various physical light units.

Section 2 holds the diaphragm quadrant *B*, shown in Fig 3, with its aperture of 20, 5, 2 and 1 mm. Fig 3 shows the form of the quadrant with the 5 mm. diaphragm *in situ* and its indicator scale *S* which is attached to Section 1.

Section 3.—Inset in this section is the seating *E* of the polaroid disc C. The seating is circular and projecting from it is the arm *E*, by which *C* is turned which serves as the indicator of the percentage change in the illumination. The seating is shaded in Fig. 2.

Section 4.—Inset in this section is the seating *F* of the polaroid disc *D*. The seating can be turned about 10° right or left and is fixed, when correctly adjusted to the axis of polaroid *C* by a screw *G*. This passes through a slot in the seating *F* which is sufficiently long to give the required range of adjustment. It is intended as a fine adjustment to correct any error which may be made when cementing the discs in their seating. The two polaroids are adjusted so that at zero on the scale their axes are at right angles and no light except a deep red passes, while at 100 on the scale their axes are parallel and the maximum of light is transmitted.

The four sections of the reducer are held together by screws and the whole is attached to the front of the lantern by wood screws.

When prepared for an observation the lantern, which runs between guides on the base board, is pushed into close contact with the back of the observation chamber so that the diffuser plate of opal glass is flush with the outer back surface; the distance of the diffuser from the opal screen of the chamber should then be exactly 25 cms.

When calibrating the adaptometer the distance (from the zero point on the millimetre scale to which the lamp must be moved) is found at which the illumination from the diffuser corresponds to 1 c.p. and ½ c.p. respectively.

The above details are given to assist instrument makers or others who may wish to construct the adaptometer.

Calibration.—That is the determination of the intensity of the light visible to the subject as a background to the figure he has to distinguish in fractions of a ft. candle.

The primary measurement of the light emission from the diffuser has been made with a sensitive selenium-coated front-wall photo-electric cell giving 3 micro-amps per ft. c. of incident light with the micro-ammeter employed. The light value of the cell was determined with a Hefner lamp giving 0·9 ft. c. at 1 foot distance, in the Physics Department of the Cairo University.

The calibration must of course be carried out for each apparatus and should, where possible, be repeated periodically. It is carried out as follows:—

The photo-electric cell is fixed with the sensitive surface exactly 25 mm. from the opal surface of the diffuser plate, the full diaphragm aperture of 20 mm. being used and the polaroid percentage indicator at 100 on the scale.

The battery current is then switched on and the voltage adjusted by the rheostat to 5 volts.

The lamp holder is then moved forward until the ammeter shows 12 milli-amps. The position of the lamp as indicated by the millimetre scale will then correspond to a light intensity of 4 ft. c. at distance of 25 mm. from the diffuser.

At double this distance the intensity will equal 1 c.p. at four times ¼ c.p. The 4 c.p. position is verified 5 times and the mean, if any discrepancy occurs, taken.

The measurements on the millimetre scale being found at which the intensity is 1 and ¼ c.p. respectively are recorded on a card which is issued with each apparatus, as these are working intensities of the light source at which observations will be made. The card is permanently attached to the lantern casing.

It is evident that the opal screen of the chamber being 25 cms. from the diffuser and the light emitted by the latter being measured at 25 mm., the light incident on the screen with the lamp in the 1 c.p. position will be 1/100 c.p. or in the ¼ c.p. 1/400.

A correction has to be made in addition, as the opal glass screen does not emit the full amount of the incident light.

For example, in the last apparatus calibrated, the opal glass used was found to transmit 7/10 of the incident light. The illumination of the background visible to the subject will therefore be diminished to that extent.

The factors required for the estimation of the luminosity of the background are :—

(*a*) The light emission from the opal screen, with the full aperture.

(*b*) The diaphragm size used (5, 2 or 1 mm.).

(*c*) The candle-power used (1 or ¼ c.p.) and

(*d*) The percentage reduction on the polaroid scale.

Thus with the lamp in the 1 c.p. position the 5, 2 and 1 mm. diaphragms reduce the light to 1/16, 1/100 and 1/400 of the maximum respectively, and with the lamp in the ¼ c.p. position to ¼ of these figures. It being possible to reduce the illumination further to from 90 to 10 per cent. with the use of the polaroid reducer.

A table of values is issued with each apparatus, calculated from the calibration figures, from which the readings obtained can be converted to fractions of a ft. c. A copy of this should be kept inside the lantern.

Two 6-watt (motor-car side lamp) bulbs are provided with each adaptometer, the 1 c.p. and ¼ c.p. position for each being given

on the card attached to the apparatus. The lamps have been aged before issue by 100 hours' continuous run.

INSTRUCTIONS FOR THE USE OF THE "ADAPTOMETER."

1. Care must be taken that the voltmeter shows 5 volts. If it shows a higher voltage, the rheostat knob must be turned clockwise.

If 5 volts cannot be obtained, the battery requires recharging.

2. The lamp must be fixed at the exact point on the lamp scale stated to give 1 or $\frac{1}{4}$ c.p. as the case may be.

3. The lantern must be pushed well home so that the diffuser plate is in contact with the observer's end of the observation chamber.

4. *Position of the subject.*—The subject should be seated with his feet together and his knees between the legs of the table so that his chest touches the end of the apparatus, his forearm and hands placed on the table on either side of the base board of the apparatus. The observation chamber must be raised so that it is adjusted to the patient's sitting height, so that he can press his face against the visor without stooping. Unless this is done there may be a leak of light between the visor and the face below the eyes and around the nose. The subject should be sitting as upright as possible, leaning forward with the visor at the normal level of his eyes.

5. In making an observation on the light adapted eyes, the 1 c.p. illumination should be used with the 20 mm. diaphragm. If this is found to be too high a degree of illumination, the diaphragm must be changed to the 5 mm.

6. *Procedure in testing for dark adaptation.*—The $\frac{1}{4}$ c.p. position of the lamp and 1 mm. diaphragm are used. If, with the reducer arm at 100, the subject still cannot distinguish the figure, the 2 mm. diaphragm must be put in place of the 1 mm. If this is still insufficient, the lamp must be shifted to the 1 c.p. position.

7. When making an observation, the reducer arm is placed at zero scale, the light being turned off, the subject is asked if he can see anything. If he can, there is a leak, which is probably at the visor, if it is not adjusted correctly to the subject's sitting height.

If not, and the room is brightly lighted, it is probably at the junction of the lantern and chamber, or at the slot through which the lantern slide carrier enters. As a precaution, a piece of black cloth should be draped over these two places.

8. If, as should be the case, the subject sees nothing, the reducer arm is advanced to twenty on the scale, the light switched on, and the arm advanced slowly 10 divisions at a time until the subject states that he sees a faint light, the scale reading is noted

and the procedure continued until a point is reached at which the subject can distinguish the form of the test figure. The reading at that point is noted. The result is confirmed by changing the test figure and repeating the procedure.

9. The following procedure is recommended if measuring the adaptation to darkness of a number of individuals.

(*a*) The name, age and other details of each subject are entered upon a card.

(*b*) The subjects are then called one by one and the retinal sensitivity of the light adapted eyes tested, and the result recorded on the card. The purpose of this is mainly to instruct the subject as to how he should sit at the apparatus, and the procedure generally, so that after dark adaptation when he is brought to the apparatus blindfold he will know what to do. The number of steps the chamber must be raised to suit the height of the subject's eyes should be noted.

As each subject is finished, he is told to sit on the verandah or in front of an open window facing the light. He should not sit in direct sunlight.

After twenty minutes, the subjects are called in one by one at intervals of about 3 minutes, in order of their examination. The subject is then either placed in the dark room (if available) or is fitted by the observer with a black eye-mask and sent to wait in any place which is not brilliantly lighted. If the eye masks completely exclude all light, he may sit on the verandah with his back to the light.

(*c*) After thirty minutes, the first subject is called in, a black eye-mask having been placed over his eyes before leaving the dark room. He is guided to the chair, and then seated in the correct position, told to keep the eyes closed until told to open them. The observer then removes the eye-mask and tells the subject to press his face against the visor, and then open his eyes.

The test is then carried out as described above.

The following shows the type of record which should be kept for each subject:—

(*a*) Age of subject.
(*b*) Does subject think he has good or bad night vision?
(*c*) Is there any visual defect?
(*d*) Threshold of light perception after 30 mt. in dark.
(*e*) The same for form perception.
(*f*) Date of test.
(*g*) Date and result of any previous test.

In view of the fact that the general purpose of the apparatus is to test men for night blindness or defective dark adaptation by determining the threshold sensitivity of the retina to light after a

period of thirty minutes in the darkness, the preliminary twenty minutes period of bleaching may be omitted, and the subjects, after the retinal sensitivity of the light-adapted eye has been tested (procedure B) may be admitted at once to the dark room.

Discussion

It must be clearly understood that the method of observation is designed to determine the capacity of an individual to distinguish an object after dark, that is the threshold lighting of the background against which the outline of the object can be seen, and, if the form is one the subject is familiar with, the recognition of the nature of the object.

The threshold of light perception is slightly lower; there is, in fact, a noticeable gap between the point at which the subject first perceives light and his recognition of form.

The light threshold and the threshold for the perception of form in a large number of individuals do not run parallel. The probable cause of this is that in the recognition of form an intellectual process is involved.

There are certainly other factors concerned in form recognition than in the simple perception of light; if, however, the subject be instructed (in section 8 of the procedure described) to state

(*a*) when he sees the faintest sign of light and

(*b*) when he can recognise the form of the test figure, a double purpose is served first whether the dark adapted eyes are less sensitive to light than the normal and secondly whether the subject has sufficiently good night vision for his duties.

In the R.A.F. medical examination the threshold of " form perception " is the basis of the night vision test.

Air Commodore Keith Lyle has been good enough to give me the results obtained with the adaptometer in tests of night vision in 1,000 air crew candidates carried out by the R.A.F. Medical Board at Heliopolis, and of 44 French candidates examined at the request of the French Air Force and Naval medical boards at Algiers. Air Commodore Lyle states that the simplicity of this adaptometer, and the fact that only one man is examined at a time has made it of great value when dealing with men who do not speak English, or with men who are stupid or non-co-operative. Furthermore, with a large dark room, a considerable number of men may be examined at one sitting. The standard threshold adopted for a " pass " for air crew service was ·0021 m.f.c. or less.

The procedure used was to test simply the threshold of the " form perception " after 30 mts. of dark adaptation, which was carried out by keeping the candidates in a completely dark room for this period.

In a first trial the point was noticed at which the subject could describe correctly a test figure, *e.g.*, an "E." A second trial was then given immediately after the first with a different figure, and the result recorded. Thresholds observed in one thousand subjects are as follows:—

With a "pass" threshold of ·0025 m.f.c. Mean result first trial ·00224; second trial ·00185. Failures—first trial 11·6 per cent.; second trial 4·4 per cent. Pass threshold ·0021. Failures first trial 30 per cent.; second trial 12 per cent.

The lowest threshold observed for form perception was ·00103; the highest ·0086.

The trials were given at the same sitting, the second immediately after the first. It is obvious from the results that at least two trials are essential. The improvement in the second is doubtless due to the subject's familiarity with the procedure.

The essential visual quality for air crews is good form perception at night; for this reason the threshold of light perception was not examined.

The results in 44 French candidates tested at Algiers with a ·0021 threshold were as follows:—

Pass 91 per cent.; failures 9 per cent.

The mean figure for subjects registering ·0021 m.f.c. or less was ·00151, the lowest figure ·00103.

A comparison was made of the results observed with the apparatus described, the Watson adaptometer and the Livingston rotating hexagon.

Tests of 24 subjects with the first type of adaptometer showed 24 passes; with the second (threshold less than 7·5 micro-Lamberts) 18 passes, 6 failures and with the third, 21 passes and 3 failures.

From the results obtained later from 100 normal subjects, Air Commodore Lyle concludes that subjects who pass with the adaptometer described in this paper, would usually pass with the Livingston rotating hexagon.

The determination of the minimum threshold for light in the dark adapted eye is not of the same importance for the purpose for which the adaptometer is designed, namely the detection of night-blindness and its degree, or the suitability of an individual for duties in which good night vision is required.

The apparatus could, with necessary modification in procedure, be used for measuring the rate of adaptation and the plotting of the relative curve.

The number of subjects that could be examined in an hour would, however, be very limited, possibly two; whereas the simple testing of form perception can be easily made on 15 or even more subjects in an hour with proper organisation.

The procedure in the majority of dark-adaptation tests is to "bleach" the retina by exposure of the eyes to a strong light of known candle-power, *e.g.*, a 50 c.p. lamp, for a definite time, *e.g.*, 3 minutes, immediately before the period for dark adaptation begins.

This seems to be essential if the rate of adaptation is to be determined, but is unnecessary if the final threshold only is to be measured as this appears to be unaffected by the extent of the preliminary bleaching.

In the procedure described, the eyes are exposed to the light on a shaded verandah which, on a bright day in Egypt, often corresponds to the equivalent of 900 ft. c. and the test is therefore carried out on the completely light-adapted retina.

If the accommodation is limited and efficient dark goggles (black or deep red) are available, the 30 min. dark adaptation may be carried out without the men leaving the verandah until they are called in for testing.

A fixation point of red light is not used partly to avoid complication of the apparatus and partly because the area of the retina covered by the image of the 7 cm. square is that which is normally used in observation of the foreground. This area is 5 mm. square and the diagonal extends for about 3 mm. from the edge of the fovea (an angular distance of 9°) into the extra-foveal region of the retina. Apart from this, subjects may be encouraged when the test begins to move their eyes, to look about them, and under these conditions peripheral regions of the retina much further from the fovea will be exposed to any light emanating from the opal screen.

An objection to the use of a fixation point, which seems to me to be of importance which I have not seen discussed in the literature, is this:— the fixation point is in some instruments not very distant from the point of normal near vision. This being so, accommodation with convergence of the visual axes must occur and must undoubtedly be accompanied by reflex contraction of the pupil with a corresponding diminution of the light reaching the retina.

When the procedure to be used was drawn up, the question arose as to whether a mydriatic should be used in view of the fact that the size of the pupil in the dark adapted eye varies in different individuals and under different conditions. (*See* Phillips, *Proc. Roy. Soc.* 127, 405, 1939 and Sloan, *Arch. Opht.* 21, 915, 1939). It was decided first that a mydriatic should be excluded by the fact that most of the men were not hospital patients and would be incapacitated for that day. Secondly because the object of the test was not to determine the threshold of the retina with the full dilated pupil but the subject's normal vision with the dark adapted retina.

The unit adopted for the measurement of the light visible to the eyes of the subject is the foot candle or milli-foot candle. This seems to me preferable to the physical units (micro-lux or micro-micro-lambert or their corresponding log-units), used by some investigators, or the purely arbitrary units used by others.

As pointed out by Mandelbaum (*Arch. of Ophthal.*, August, 1941) it is necessary to employ the logarithmic expression of the units employed (log units) in plotting the adaptation curve if any accurate representation is to be obtained of the rapid changes in the early stages of adaptation.

The international candle is the recognised standard of the intensity of luminous emission from any source of light and is the basis of all other units employed. One candle power is the intensity of the light emitted by one standard international candle (1 Hefner is 0·9 of this and is the light emitted by the flame of a particular type of lamp). A foot candle is the intensity of the light at a distance of 1 foot and a metre candle at a distance of 1 metre.

A brief description (*see* Footnote) of the modern physical units used by some investigators of dark adaptation has been included partly to show, as mentioned above, that their primary basis is the light of one standard candle; and partly to assist those not acquainted with these units to convert them to the more familiar fractions of a candle power. The foot candle is a term which explains itself; it is a unit to which all clinicians would attach a definite meaning. It may safely be said that very few would understand the meaning of the lux or the lambert however valuable these terms may be to the pure physicist.

FOOTNOTE.—The lumen is the light unit of energy falling on (or emitted by) an area bounded by the sides of a pyramid with an angle of 57·3° (the solid radian) from a point of one standard candle power at the apex of the pyramid angle.

Thus the energy falling on any sectional area of the pyramid at whatever distance is the same.

Units based on the above are:—

The foot candle = 1 lumen per ft.^{2} The lux = 1 lumen per m^2

Thus as 1m^2 = 10·75 ft.^{2} to convert micro-lux into milli. ft. c., the figures for the former would have to be divided by 10760.

Therefore 1 m.f.c. = 10760 micro-lux; and 1 micro-lux = ·0093 m.f.c.

The lambert is the unit of brightness. It is the brightness of a surface emitting 1 lumen per centimetre.

One sq. ft. = 930 cm.^{2} (approx.). Therefore 1 lambert = 930 ft. c.

This being so, the micro-micro lambert = ·00000093 m.f.c. The micro lambert = ·93 m.f.c., and the milli. ft. c. = 1·075 micro lambert.

OPHTHALMOLOGY IN LECTURES OF A CENTURY AGO

BY

R. R. JAMES

WOODBRIDGE

ABOUT 115 years ago a volume of lectures was published on anatomy, surgery, pathology, including observations on the nature and treatment of local diseases which were delivered at St. Bartholomew's Hospital, by Abernethy. A few ophthalmic extracts of a century ago may be of interest.

As a lecturer, Abernethy's style was distinctly colloquial. He believed in repetition and was a great narrator of case histories bearing on the various diseases. He must have known how to keep the students interested and the fact that emphasis by reiteration was an important means of helping his audience to appreciate the essentials.

He gives a very short section on elementary optics, but his main thesis in ophthalmology is in operative surgery. Here and there in the body of the work are some case histories which have an ophthalmological bearing. For instance, under sarcomatous tumours, and he uses the term sarcomatous, not in the modern malignant sense, but as indicating fleshy tumours, he relates the experience of a Russian doctor, travelling in Italy, who met a man with a large tumour hanging over the side of his face. It was seven inches in length with a circumference of 3½ inches. It had been forming several years and he induced the man to let him remove it. He found that it grew beneath the conjunctiva of the lower part of the globe and lower lid and protruded between the lids. After cutting carefully through the conjunctiva he removed it and much to his surprise, the cornea, even where it had been covered by the tumour, remained transparent.

In dealing with the treatment of ulcers he calls attention to the possibility of belladonna poisoning following local application. Under a short section on delusions of sight he tells a story of an accident to himself when riding. The horse threw up his head and Abernethy received a pretty severe blow on the nose.

On reaching a stable near at hand he washed his face and squeezed the nasal bones into their proper place as well as he could. "The people were certainly very kind, and wished to send for a surgeon to me; but I told them I would rather they sent for a hackney coach, which they did, and I went home in it." He then perceived an imperfection in his sight. This was indistinct, from the eclipse of the *third* of every object on the right side. "If I saw a long

name as my own, for instance, *A-ber-ne-thy*, in a bookseller's shop window, or any such place, I could see *A-ber-knee*, but I could not see the *thigh* at all." He tried each eye separately as well as the two together and found no change. He refers to Wollaston's views on similar cases. Discussing this experience with a medical friend, Abernethy said that he regretted that when he was in this state he had not *squinted*, to have seen how the things would have looked then. "But since that time I have been entertained with it often, and often without having any blow; and I have on these occasions squinted too, and it's just the same. And let those account for it as arising from a decussation of the nerve, do it; My own opinion is, that it arises, from the *irregular actions of the retina*." In parenthesis, a case is told of a man who got scotomata after taking a cup of tea or coffee. "As he got better, and less nervous, he has only seen the arms or legs of persons, without seeing any other part of them." Headache is not mentioned in connexion with this case, but it reads like one of migraine.

In the section on operative surgery Abernethy deals mainly with cataract. He demands mobility of the iris, before deciding to operate; in other words he fights shy of synechiae as evidence of past inflammation. And he insists on the presence of perception of light. "I should choose a person who could see the transit of a candle through the room, or tell me where the windows were."

He describes the operation of couching and incidentally ascribes it to Celsus and says that the term is one he should like to see expunged from the surgical dictionary.

"Of late, Mr. Hey, of Leeds" has advised the operation of posterior needling. He seems to have coupled it with reclination. Mr. Saunders brought the same operation into practice, performed from the front of the eye; but he was particularly induced to do it on children who have been born with cataract.

"Extraction of the lens is a very difficult operation, very difficult." Abernethy extols Mr. Phipps as an operator. He used a broad knife (which was almost certainly Beer's knife), but did not complete the whole corneal section with it. He left a little filament of cornea below which he divided with another little knife, with which he seems to have opened the capsule of the lens as well. Pressure then delivered the lens: "it will jump out into a bottle."

The only other subject mentioned in this section is mucocele and lacrymal fistula. He describes Blizard's method of treatment by filling the sac with quicksilver, mentions syringing and the insertion of styles. And as a matter of course he places, in every word he utters almost, very strong emphasis on the need for attending to the general health and the state of the bowels.

SOME HISTORICAL NOTES ON SPECTACLES AND ON BERYLLUS*

BY

G. TEN DOESSCHATE

UTRECHT

IN classical literature mention is sometimes made of the magnifying power of transparent media[1], but it is improbable that magnifying glasses were known in Europe before the XIIIth century. Ptolemy, who lived at Alexandria about A.D. 150, gives some details concerning lenses and discusses the course of rays of light, passing from one medium into another[2], but as the last part of his famous treatise on optics is lost, one cannot tell how extensive his knowledge was. It was the Arab Alhazen (about A.D. 1000) who wrote on magnifying glasses[3]. He describes how objects, when seen through a segment of a sphere, which has an index of refraction greater than that of the surrounding air ("grossius aere"), seem to be larger than they are in reality. This optical effect of lenses is not described in European literature before the XIIIth century. It is generally held that Roger Bacon (c. 1214-1294) was the first European scholar to mention the practical utility of lenses. In his *Opus majus* (written 1266-1267) he describes how to magnify writing by placing a segment of a glass sphere on the text with its plane side down.

But, as shown elsewhere[4], there was another Englishman, Robert Grosseteste (1175?-1253), Bishop of Lincoln, who anticipated Bacon. In his treatise "*De iride seu de iride et speculo*[5]" there is a passage, which can be translated thus: ". . . it will be perfectly clear . . . . how far and how large and in what shape a body, of which the distance, size and place are known, will appear to the eye, when there is a diaphanous body, of which the distance, size and place are also known; and it is clear in what manner transparent bodies must be moulded, so that they may receive the visual rays, emanating from the eye[6], under an angle, as wide as they wish it, and how they may collect the rays on the visible objects, whether those objects are big or small, far or near; and so they may see each visible object wherever and in any size they wish; and they may operate, that very long objects appear to be short and, in contrast, that very small and far objects are clearly visible." As far as I know Robert Grosseteste, was the first scholar in Western Europe who wrote on optics and so he deserves well of science. There was a third Englishman who had great merits in connection with optics—John Peckham (1228-1294), Archbishop of Canterbury, renowned for "*Perspectiva communis*," a book which appeared in subsequent centuries in several printed editions[7].

* Received for publication, June 13, 1946.

So three Englishmen, Grosseteste, Bacon and Peckham in the XIIIth century introduced modern optics in Europe.[8]

Though lenses were known before the XIIIth century, nowhere is magnifying power mentioned. Lenses had already been used as burning-glasses in ancient times. Sun-glasses are described by Pliny[9], Lactantius[10] and Macrobius[11]. And several instances, taken from mediaeval books will be mentioned hereafter. The question: who was (or were) the inventor(s) of spectacles, need not be discussed here. Many competent scholars have treated this subject fully. Here we are concerned with the Dutch word "Bril" (spectacles) and the old French "bericle". These words are derived from "Beryllus", the name of a precious stone, which was greatly valued in ancient times[12]. Trying to solve the question why our common optical instrument was called after a gem, I inquired what the classic, mediaeval and later authors, and the lexicographers have to say regarding "bril", "bericle" and "beryllus". The following notes show that there exist etymological relations between beryllus, eye, diseases of the eye and the act of seeing.

(1) *Mineralogy of beryl.* Beryl[13] is the name applied to the precious stone including the emerald, the aquamarine and other transparent varieties known as "precious beryl", with certain coarse opaque varieties unfit for use as gems. Beryl is a silicate of beryllium and aluminium ($Be_3 Al_2 Si_6 O_{18}$). It crystallizes in the hexagonal system. The colour may be blue, green, yellow, brown, colourless or rarely pink. Rolled pebbles of beryl occur. The colour of the green varieties depends on the presence of chromoxide[14]. Beryl is not very hard, so it can be easily polished, but when it is exposed to the influence of other hard objects, it soon loses its brilliancy, and so it is not a material fit for lenses in spectacles. It seems that the ancients, who could not judge of the gems by chemical analysis, had a conception of beryl, different from that of modern mineralogy, and it is likely that the green variety, which is mentioned by Pliny[15], was identical with what nowadays is called aquamarine[16].

(2) *Etymological considerations.* A Dutch etymological dictionary (Franck's *Etymologisch Woordenboek der Nederlandsche Taal*, second edition, 1912) gives: *Beril*, Old Dutch *beril* and *berikel* (from Old French *bericle*, Middle Latin *beric(u)lus*). It is an international word derived from the Latin *beryllus*, Greek *βήρυλλος* and is connected with Sanskrit *vaidurya*, Prakrit *vérûliya* or *vélûriya* (Old Indian *vaidûrya*).

In Arabic it was: *ballawr* or *bilaur* and in Persian *bullur*[17]. Concerning the word *bril* we read: Dutch *bril*, Middle High German *berille*, *barille*, *brill(e)*, New High German *brille*, Old Dutch *berille* (c. 1411)[18].

There are other modifications of the word[19]. It will suffice to direct

attention to the fact that the French words "briller", "brillant" etc. seem to be connected with beryl, and that in a French dialect "brenicle" means: "Oeil enflammé, étincelant", "bernicles" = "yeux clignotants," "bernikas" = "personne qui porte des besicles, qui louche" etc. The Spanish "vericle" means "a steel mirror[20]."

Discussion

In Franck's etymological dictionary it is said that spectacles, which were invented about 1300, contained lenses which were made of beryl[21]. It may be doubted whether this be true. As far as I know, there are no such spectacles preserved. But there must have existed beryl spheres. For, as it was already stated, in nature rolled beryl pebbles occur. And medieval authors mention spherical beryls as sun-glasses[22]: "De reonde taille . . . ." "Il brusle la main qui le tient contre soleil." It is said, that lenticular berylli were used as adornments on reliquaries and monstrances and the fact, that the contents of the shrines were seen magnified through those lenses, could have led to the invention of spectacles and magnifying glasses[23]. In Meyer's *Konversations-Lexikon* (6th edition) it is stated, that the German word Brille is derived from Berilli, the name of "transparent pieces of stone and glass". I could not ascertain that the meaning of beryllus was so wide, but in Du Cange's *Glossarium mediae et infimae Latinitatis*, the following statement is made: "Bericlus, non lapis pretiosus, sed crystallus, nostris olim Bericle," and: "Demanda icellui Vincent quelle pierre c'estoit . . . . et le suppliant dist que c'estoit *cristail* ou *bericle*[24]."

If it be true, that the meaning of beryllus was so wide, we can understand why the word "bril" was chosen to indicate spectacles. There is still another possibility: Some authors believe[25] that the first spectacles contained lenses, which had the sea-green colour of beryl. Von Pflugk[26] says that the glass, which was used by the first Germans, who made spectacles, was green and the lenses in antique spectacles are green. It is thus possible that spectacles received their Dutch name by analogy. Moreover it may be the merchants, who sold spectacles, pretended that the lenses were made of beryl, so that they might seem to be more precious.

Curative powers were ascribed to beryllus. In the first place it was supposed, that the green colour was beneficial to the eyes. This was already mentioned in ancient times. Pliny[27] tells us, how Nero looked at the performances of his gladiators through an emerald, and the same author says, that tired eyes can be restored by looking at green objects. This belief is still extant. It depends perhaps on the fact, that most men when looking at large fields and woods

receive an agreeable impression. Suchlike beliefs have often a remote origin. In this case it is perhaps connected with a very old source. According to W. J. Perry[28] (who refers to Donald Mackenzie) the Egyptians thought that green was life-giving because that was the colour of the Nile flood water when it first started in July[29].

Secondly, in old times men believed that beryl could have a pharmacodynamical effect on the eyes. Marbodus[30] says:— "Infirmis oculis in qua jacet (beryllus) unda medetur."

That water, which has been in touch with beryl, possessesa curative power in cases of diseases of the eyes, is also suggested by the following:—

"Li eve u lavee est li piere" (eve=water).
"Porte sante a le lumiere."
"A l'uel, se on i a dolor" (uel=eye).
"Rent i clarte, rent i color."[31]
And:—
"Les oil malades sainera."
"Li vins u L'uom la lavera."[32]
Also:—
"Les iex oscurs ceste aigue esclaire" (aigue=water.)[33]
And:
"Met en ses oelz de mal guerist."[34]

Vincentius Bellovacensis, referring to "Helinandus in Chronicis Lib. X., says: "Aqua in qua jacet pota, valet infirmis oculis," and, according to Dioscorides: "Aqua in qua missa est, pota, valet infirmis oculis." So the water was given by mouth.

Finally, Bartholomaeus Anglicus[35] mentions the curative power of the beryl: "humidos oculos sanat." Historically there exist therefore two relations between beryllus and eye: the chromotherapeutic and the pharmacotherapeutic action.

It seems possible, that when men first used spectacles, they believed that improvement of visual acuity was caused by the pharmacological power of the gem. This may seem odd, but we must not forget that optics was then a young science, was studied only by a few scholars; and the artisans, who manufactured the lenses were mere empiricists, who understood nothing about the theory of the course of the rays of light. And so they and their customers may have believed that the proximity of the beryl was a sufficient reason to raise visual acuity.

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2. L'Ottica di Claudio Tolomeo . . . . , edition Govi, 1885.
3. Opticae Thesaurus, edition Risner, 1872.
4. TEN DOESSCHATE, G.—(1940). *Ophthalmologica*, Vol. XCIX, p. 333.

5. There are existing at least Mss. of this book; four at Oxford, one at the British Museum. *Vide*: Die philos. Werke d. R. GROSSETESTE, edition L. Baur. (1912).
6. GROSSETESTE believed that we see by rays emanating from the eye.
7. "Perspectiva" means "Optics".
8. There was still a fourth author on optics; Vitello, a Pole, wrote a voluminous Perspectiva. Elsewhere (De derde Commentaar van Lorenzo Ghiberti etc., 1940) I suggested that Vitello wrote his book, after he had taken cognizance of Peckham's Perspectiva.
9. XXXVII, X.
10. De ira Dei, CX.
11. VIII, XIV.
12. PLINY.—XXXVII, XX.
13. *Encycl. Brit.*, 14th edition.
14. *The Encycl. Americana*, 1922.
15. PLINY.—(XXXVII, XX) says, that the finest sort of beryl is sea-green (qui viriditatem puri maris imitantur"). In the Dutch language beryl sometimes is called "zeegroen-steen" (sea-green stone) and "zeewater-steen" (sea-water stone).
16. LAROUSSE.—*Grand Dict. Univ.*, "Quelques auteurs, le pere Monnet entre autres, dans son Dictionnaire, pretendent que le beryl n'est autre chose que le diamant".
17. Algemeen verklarend Woordenboek, 5th edition 1912.
18. "Bericle li Englois le claiment." "Qui mont le prisent et mont l'aiment." Lapidarium of Berne. v. 487.
19. Berillistics mean fortune-telling by means of mirrors or crystal spheres. "Berillistica est ars ipsa visiones in berillis et crystallis videndi" Paracelsus.
20. MEYER-LUEBKE.—Romaniches etym. Woerterbuch.
21. Also: Pauly-Wissowa, Real-Encycl. and W. v. Wartburg, Franz. etymol, Wtb.
22. Lapidaire en vers, v. 1229 This French Lapidary was a translation of a book written by Marbodus, Bishop of Rennes (between 1100 and 1125). Vide: L. Pannier, Les Lapidaires français du moyen-age, 1882. The same fact is also mentioned by Vincentius Bellovacensis (c. 1264), Speculum quadruplex, 1624, Lib. VIII, VII), and by the English polyhistor Bartholomaeus Anglicus, De proprietatibus rerum, Lib. XVI, XXI (written about 1250).
23. Baist in Kluge's Etymol. Wtb d. deutschen Sprache, 6th edition, 1899. Hirschberg (Graefe-Saemisch T. XIII, p. 283) says, that Beryllus was the medieval name of "Krystall" or glass.
24. Litt. remiss. ann. 1449 in Reg. 179 Chartoph. reg. ch. 349; *Vide* Du Cange.
25. PAULY-WISSOWA.
26. FARBIGE.—insbesondere gruene Glaeser als Augenschutz, 1929, p. 10.
27. XXXVII, XVI.
28. The growth of civilization, p. 49-50.
29. The ancients knew that a strong light could injure the eyes. Snow-blindness is described by Xenophon; Lucretius, IV, 321, says that looking at the sun can cause blindness. On the other hand it was also thought that darkness was injurious to the eyes. So Isidorus Hispalensis (V, XXI) gives the queer etymology: "nox a nocendo dicta, eo quod oculis noceat," and Beda Venerabilis (De natura rerum, 1529, p. 17) says nearly the same thing. So it seems that the ancient authors who believed that colours consisted as a mixture of white and black, chose a mixture (in the form of a coloured glass) between strong light and darkness.
30. De Gemmarum lapidumque pretiosorum formis, etc. Coloniae, 1539, p. 28.
31. Lapidarium of Modena, v. 387 sqq.
32. Lapidaire en vers.
33. Lapidarium of Berne.
34. Lapidarium of Cambridge.

PLASTIC RESTORATION OF UPPER LID AND SOCKET*

BY

JAN LUC

(MAJOR, POLISH A.M.C.)

IN the June (1944) number of the *Brit Jl. of Ophthal.*, the Editor emphasises the need to train eye surgeons in the principles of plastic surgery.

The necessity of such training seems to be all the greater for a military eye surgeon who, under war conditions, is very often unable to get in touch with a plastic surgery centre or has to wait for many

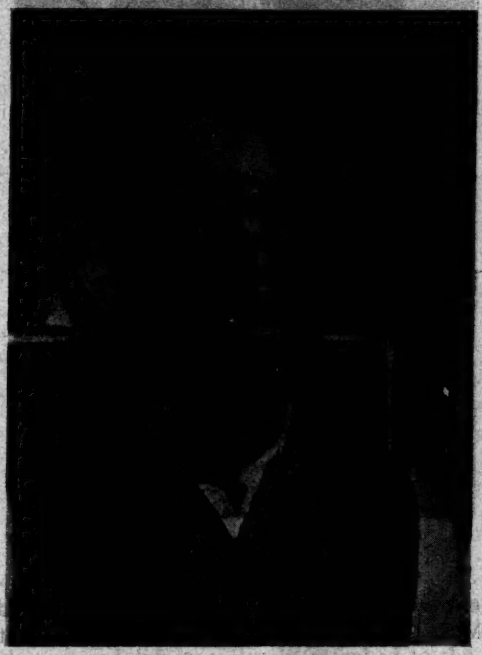

FIG. 1.

weeks before his patient can be admitted, the centre being overburdened with work. From my very modest experience in this hospital I venture to present a case of a successful plastic operation on an upper lid and socket.

* Received for publication, June 21, 1946.

The patient, Polish Lac. I. P., wounded by a shell explosion in Italy had his eye enucleated on November 13, 1944, by Capt. R. H. Hughes, R.A.M.C., and was transferred to the 3rd Polish hospital in Italy, which sent him to the United Kingdom with the diagnosis "enucleated right eye, defect of lids, socket shrunk, evacuated to U.K. for plastic operation."

FIG. 2.

The patient was seen in this country by Prof. Ballantyne at Killearn E.M.S. Hospital who advised his immediate transfer to a plastic unit.

The patient waited for a considerable time for admission to a plastic centre and finally, while the arrangements were still incomplete, was transferred to the 1st Polish Military Hospital.

When I saw him first his condition was as follows: The right upper lid showed a very large coloboma to such an extent that little more than a scarred and shrunken fragment of the lid was to be seen in the medial and outer canthus closely adhering to the socket.

The socket in its upper portion was contracted, in the lower clean and healthy.

I decided to operate on him myself and as a first step to restore his upper lid. For this purpose the fragments of the lid in the region of both canthi were released and undermined, under local anaesthesia, in order to move them into position but it was impossible

FIG. 3.

to sew the two parts together without tension, so a sliding graft from the skin of the temple was used. The result was very encouraging but the newly restored lid was closely attached to the socket. In order to enable the patient to be fitted with an artificial eye the non-existent upper fornix had to be restored.

The operation was performed under infiltration anaesthesia following the modified Esser's method. From the inner surface of the right arm a free skin graft was taken because I judged a mucous membrane graft from the lip to be insufficient and too small for this purpose. An incision was made on the conjunctival side of what

corresponded to the inner margin of the upper lid throughout its entire length. The skin was undermined to the required depth and an upper fornix formed. A piece of dentist's mould was then shaped so as to fit snugly into the pocket.

The graft was then folded over the inlay which was put into the cavity and the wound was closed with 4 sutures. After one week the stitches were removed and a shell eye fitted in.

There was hardly any appreciable shrinkage. The patient was provided with an artificial eye and the aesthetic result is fairly satisfactory.

I was unfortunately unable to have his photograph taken before the operations; the photographs, Figs. 1, 2 and 3 illustrate the result obtained.

SURGICAL ANATOMY OF THE FACIAL NERVE*

With reference to the technique of orbicularis block (palpebral akinesia)

BY

M. KLEIN

LONDON

Review of Literature

IN 1914 van Lint described a method by means of which it is possible to cause temporary paralysis of the orbicularis muscle. He injected three or four c.c. of two per cent. novocain with two or three drops of adrenalin at a point situated at the intersection of a horizontal and vertical line, drawn 0·5 cm. distant from the lower and the temporal margins of the orbit. Then from a point near the external angle of the palpebral fissure three injections are given directed away from the orbital margin towards the facial nerve, one c.c. being injected at each of three separate points, so as to cover all the branches supplying the orbicularis muscle. Fig. 1.

Similar procedures advocated by Villard in 1919 and Rochat in 1920 gained little support.

Modifications aiming at blocking the peripheral branches of the nerve were suggested by Rubbrecht in 1926, and Terson in 1931. Rubbrecht advised the injections of 0·5 c.c. of 2 per cent. novocain each into the middle of the upper and lower lids, and of 0·5 c.c. near the external angle. The injections are directed towards the periosteum, and this method "makes akinesia unnecessary". Terson

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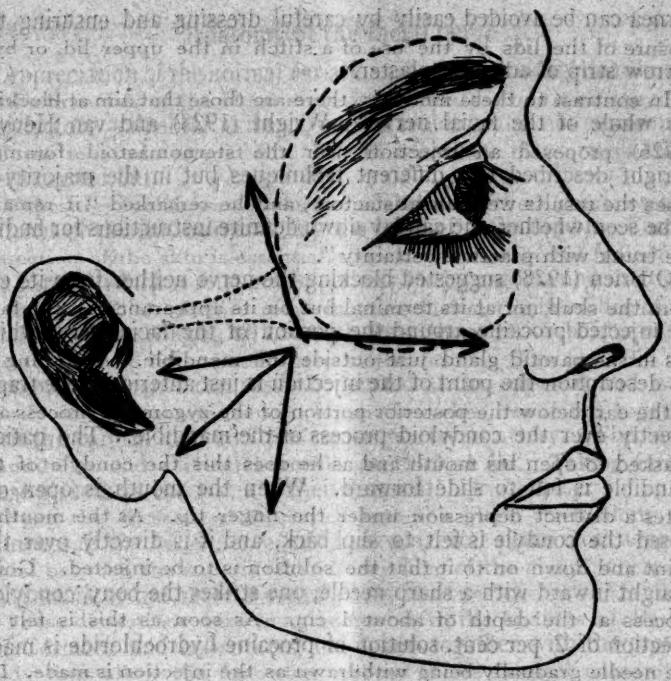

FIG. 1.

The arrows show the direction in which the injection is made in van Lint's method.

advocated (1931) injection through the conjunctiva. "Injection de détante." An injection of 3 c.c. of 2 per cent. novocain without adrenaline is made deeply above and below the external palpebral angle.

These methods aiming at the blocking of the terminal branches cause temporary paralysis of the nerve supply of the orbicularis muscle, but they have the disadvantage of causing oedema of the eyelids, during the operation. Several injections are also needed, and they may cause corneal ulcer in consequence of the lagophthalmos (Meller). However, these disabilities may be obviated. In order to overcome the lagophthalmos an injection of a few drops of novocain into the levator may be made through the conjunctiva at the middle of the upper fornix, at the same time when the akinesia injection is done (Ascher 1928). As for the oedema of the lids, this does not occur if the injection is given at the right distance from the orbital margin, and deep enough near the periosteum. Damage to the

cornea can be avoided easily by careful dressing and ensuring the closure of the lids by the use of a stitch in the upper lid, or by a narrow strip of adhesive plaster.

In contrast to these methods, there are those that aim at blocking the whole of the facial nerve. Wright (1923) and van Heuven (1926) proposed an injection near the sternomastoid foramen. Wright described two different techniques but in the majority of cases the results were unsatisfactory, and he remarked "it remains to be seen whether one can lay down definite instructions for finding the trunk with practical certainty".

O'Brien (1928) suggested blocking the nerve neither from its exit from the skull nor at its terminal but on its appearance on the face. He injected procaine around the portion of the facial nerve which lies in the parotid gland just outside the mandible. According to his description the point of the injection is just anterior to the tragus of the ear, below the posterior portion of the zygomatic process and directly over the condyloid process of the mandible. The patient is asked to open his mouth and as he does this the condyle of the mandible is felt to slide forward. When the mouth is open one notes a distinct depression under the finger tip. As the mouth is closed the condyle is felt to slip back, and it is directly over this point and down on to it that the solution is to be injected. Going straight inward with a sharp needle, one strikes the bony condyloid process at the depth of about 1 cm. As soon as this is felt an injection of 2 per cent. solution of procaine hydrochloride is made, the needle gradually being withdrawn as the injection is made. Lid paralysis begins to appear from 30 to 60 seconds and after a few minutes is so marked that the patient is unable to close the lids, and the palpebral fissure is widely opened. Atkinson (1934) suggested that if paralysis is not secured with the first injection a second injection is to be given and the needle should be inserted at another point. To avoid failure Kapuscinsky (1934) marks the site of the injection by searching the supplying nerve fibres with galvanic current which causes contraction of the orbicularis muscle if the needle is on the correct spot. This rather unpleasant procedure is quoted only to show that apparently many failures were observed.

A review of the literature shows that of the three methods, the paralysis of the terminal branches, and the O'Brien method became established, and that there is a growing recognition of the usefulness of palpebral akinesia especially in association with intracapsular extraction. Van Lint (1926) compares a cataract operation without paralysis of the lids to walking on a tight rope, and the lid retractor and bridle stitch he compares to the balancing weight which are helpful but of doubtful value. However, difficulty in laying down definite instructions for finding the facial nerve still stands, and most textbooks describe the method briefly and inadequately.

Anatomy of the facial nerve

Appreciation of the normal variations in the anatomical distribution of the branches of the facial nerve is essential both in securing more satisfactory palpebral akinesia, and in avoiding the not uncommon failures to attain any at all. For this purpose eleven dissections were carried out.

Exposure: Incisions, *superior* horizontal above the zygoma, *vertical* in front of the ear, *inferior* along the basis of the mandible. Careful dissection of the skin is essential, so as not to damage the fascia over the parotid which is attached superiorly to the zygoma and inferiorly to the mandible. Before removing this fascia, the branches of the facial nerve are sought, all of which leave the anterior border of the parotid, and lie immediately deep to the fascia. The frontalis and zygomatic branches can easily be located at the zygoma, and lying closely on the masseter several buccal branches are found together with the parotid duct and the transverse facial artery. The lower mandibular and cervical branches are looked for. Taking care of these structures the fascia is then removed.

Next the dissection is carried into the gland itself along the branches of the facial nerve, and here a natural plane of cleavage is found between the superficial and deep lobe of the gland, where the main trunk of the nerve is found.

These dissections were in agreement with the findings of Bailey, MacCormack and co-workers and taken together with the present study they allow the following account of the surgical anatomy of the facial nerve. As will be seen divergencies from the standard teaching were observed.

(*a*) *Landmarks and surface anatomy of the facial nerve.* The facial nerve after emerging from the stylomastoid foramen curls round the condyle of the jaw traversing the parotid gland. The main trunk divides usually into two principal divisions, the temporo-facial and cervico-facial portions. The point of the bifurcation occurs 5 to 7 mm. dorsal to the ramus of the mandible and on a slightly deeper plane and here the nerve is entirely surrounded by glandular tissue. (Figs. 2, 3 and 4).

The temporo-facial division as it lies on the mandible has a rather variable position. It is generally described as lying on the condyloid process of the mandible but these dissections showed that it constantly lies considerably lower and its site was found to be 1·5 to 2·5 cm. below the lower margin of the zygomatic arch. This point is at about two thirds of the level of the junction of the upper and middle thirds of the distance from the external angle of the mandible to the palpable condyloid process. As noted above the variation in distance as measured from the zygomatic arch is from 1·5 to 2·5 cm. and is explained on the basis of comparative headsize.

FIG. 2.

The position of the temporo-facial division in relation to the bony landmarks of the zygoma and angle of mandible. (After Tandler, modified).

(*b*) ***Supply of the orbicularis:*** The temporo-facial division of the facial nerve which usually supplies the orbicularis muscle frequently receives rami from the cervico-facial division, and this was to be found in seven out of eleven dissections.

(*c*) ***Pattern:*** Considerable variations of the pattern of distribution of the branches of the facial nerve were shown, but the textbook description of temporal, zygomatic, buccal, mandibular and cervical branches, was always identifiable. In more than half of the specimens there were connections between the temporo-facial and cervico-facial branches.

(*d*) ***Position of the facial nerve in relation to the parotid gland.*** The facial nerve lies between the two lobes of the parotid, and it partially separates the gland into a large superficial and a small deep portion, the two parts being connected by a slender isthmus which passes between the two diverging (the temporo-facial and cervical) portions of the nerve.

(*e*) ***Other stuctures of the region.*** The external carotid artery lies posterior and at a deeper level than that at which the injection

is usually given and the danger of injuring it is remote, but the posterior facial vein and the transverse facial artery are not free from danger.

From the above descriptions of dissections it is seen that the main divergencies from usual descriptions are (1) location of the temporo-facial division (2) The position of the facial nerve sandwiched in the parotid (3) The existence of a fascial plane in the parotid.

Discussion and conclusion

In inducing blocking of the facial nerve it is essential to know the exact point of bifurcation of the trunk into its two main divisions, and especially the location of the temporo-facial division. Both the point of bifurcation of the nerve and of main trunk of the temporo-facial division lie at the same level, namely at the junction of the upper and middle thirds of the distance between the angle of the mandible and the palpable condyloid process, which is the correct site for injection for palpebral akinesia by blocking the middle portion

FIG. 3.

The temporo-facial division is approximately at the upper third between zygoma and the angle of the mandible. In this case a novocain injection over the condyloid process (O'Brien) would probably be effective owing to the upward course of the nerve. (Author's dissection).

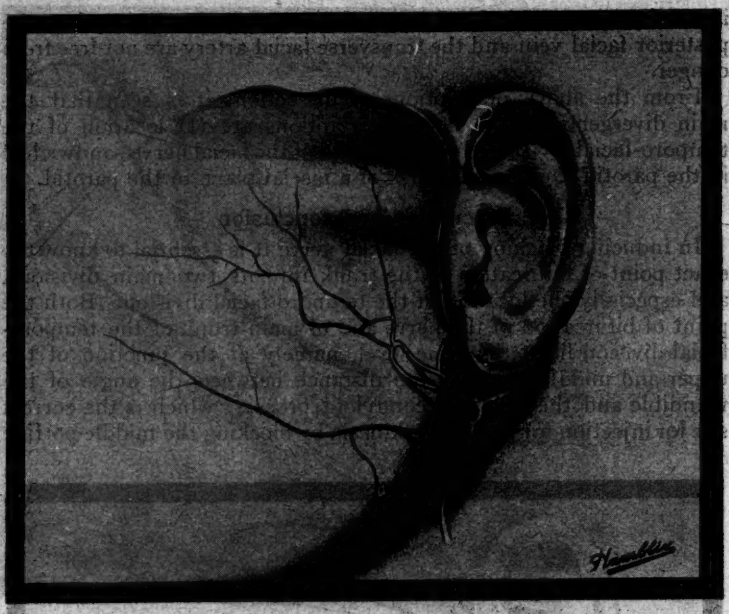

FIG. 4.

The position of the temporo-facial division is lower than in Fig. 3. A novocain injection over the condyloid process would give no result. But an injection given at the junction of the upper and middle thirds between zygoma and the angle of the mandible would reach the nerve. (Author's dissection).

of the course of the facial nerve. This point is considerably lower than it was suggested by O'Brien and recommended in most text-books. The needle of the syringe should aim at the posterior part of the lateral aspect of the mandible, and should penetrate to a depth of about 1 to 1·5 cm. until the bone as a landmark is reached. One to 2 c.c. of 4 per cent. procaine is injected while the needle is gradually withdrawn. This method is expected to be effective in about 90 to 95 per cent. of the cases. In the remainder the position of the temporo-facial division is such that the procaine will probably not reach it. In cases of failure, however, the technique of van Lint is advisable by which the terminal branches round the orbit are injected. The method advocated by Atkinson attempting a second injection near the site of the first injection is not recommended.

The frequency of connections between the temporo-facial and cervico-facial divisions is of interest ophthalmologically. One might

expect that these connections would carry fibres to the orbicularis muscle, and the blocking of the temporo-facial division would therefore cause only incomplete or partial palpebral akinesia. Experience with facial block has, however, shown that paralysis of the lids is complete in most cases, the failures being few, therefore these connections are possibly afferent in function.

Of interest too is the position of the facial nerve within the parotid gland. It lies between the two parts of the gland in a pre-formed tissue space. The spreading of the procaine in this tissue space may facilitate its penetration into the facial nerve.

Summary

1. Review of the literature of the facial akinesia shows three different approaches: (*a*) the terminal branches, (*b*) the main trunk at the stylomastoid foramen and (*c*) the middle portion of the course of the nerve near the ramus of the mandible.

2. Dissections have shown that the surface marking of the middle portion of the facial nerve corresponds to a horizontal line drawn through the junction of the upper middle thirds of the distance between the zygoma and angle of the mandible.

3. The position of the nerve within the parotid gland is in a plane of cleavage between the two lobes of the gland which may facilitate the spreading of the procaine into the nerve.

4. The correct point for the injection, when the middle portion of the course of the facial nerve is used for palpebral akinesia, lies below the condyloid process at the junction of the upper and middle third of the distance between the zygomatic arch and angle of the mandible.

My thanks are due to Prof. M. F. Lucas Keene in whose department of anatomy, London (Royal Free Hospital) School of Medicine for Women this work was carried out, for placing the material at my disposal and for her interest and helpful suggestions. I am indebted also to Dr. L. M. Dickson for her kind help and interest, and to H. Treissman, F.R.C.S. for the drawing of Fig. 1. Mr. Henry Watts, technician at Examination Hall, Queen Sq. also gave assistance.

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CERTAIN OPERATIONS ON THE SUPERIOR OBLIQUE*

BY

JOHN FOSTER

LEEDS

IT is a far cry from the day when von Graefe could describe the oblique muscles as the "noli me tangere" of ophthalmic surgery.[19]

Landolt's myectomy (tenectomy) of the inferior oblique has become commonplace, while tenotomy[3 20], recession[8] and resection[17] of this muscle are all performed with success. Terrien has even divided its motor nerve[16] supply.

Operations on the superior oblique though less common, are still well known. Examples of this are Wegner's reconstruction of the trochlea after injury[18], Hughes recession of the trochlea for overaction[10], and transplantation of the superior oblique for IIIrd nerve paralysis[7 15].

On the other hand, recession of the muscle for overaction or advancement for paresis appears to be relatively rare. Jackson 1903[13], for example, treated such pareses by transplanting the superior rectus further backwards and outwards—a technique employed as late as 1932 by Barrière.[1]

While Wheeler[19] invented a technique of superior oblique advancement, and operated successfully by it on five cases in 1935, Gifford wrote six years later[6] as follows:—

"I have not been courageous enough to recess the inferior oblique or to advance the superior oblique as Wheeler described. On account of the extensive insertion of these muscles in areas far back on the globe these operations must impress many ophthalmologists as exceedingly difficulty of execution."

Gifford, like Gibson, in the same year, advocated tenotomy of the ipsolateral antagonist, and contralateral synergist, and employed this technique in six cases of superior oblique paresis.

Since then, I have found only one recorded case, that of Borley and Renaud[2], though Professor Franceschetti told me during a recent visit to Geneva that he has several successful (unrecorded) cases.

The relative rarity of direct operations on the superior oblique tendon, has therefore prompted me to add three to their number.

I am obliged to Mr. E. C. Pemberton for the synoptophore and diplometer readings with comments, and to Mr. Claude Jellings for the photographs of the patient, the operation, and the diplometer charts.

* Received for publication, September 25, 1946.

Advancement of the superior oblique with tenotomy of the inferior oblique

Case 1.—The patient, a machine shop foreman, aged 36 years, developed concussion in 1937, from a blow on the forehead in a motor accident. As far as could be ascertained at a later date, the blow was well above the orbital margin.

From that time forward, a paresis of the left superior oblique gave him vertical diplopia in the whole lower field, accentuated by looking to the left. The central vision was normal in both eyes, and 14$^{\Delta}$ of left hyperphoria were present in the primary position.

He accepted an 8$^{\Delta}$ correcting prism which reduced the symptoms slightly, and was given three courses of orthoptic exercises in the next three years.

In January, 1943, he stated the diplopia bothered him increasingly, and therefore in July, 1943, a partial tenotomy of the right inferior rectus was performed. I suspect that fear that over-tenotomy might increase the diplopia in the important lower field, and the restraint exercised by secondary attachments of the muscle to the lid and inferior oblique led to a disappointing result in this, as in one previous and one subsequent case in which I employed it.

Certainly no change occurred in the measured deviation, and from this date he could only work with the left eye occluded.

In January, 1946, the position was unaltered. He still had poor movement of the left eye down to the left as shown in the photograph Fig. 1. At the horizontal level he had 12° of L. ex-cyclophoria at all angles, and the other synoptophore measurements were as given below: —

Straight ahead = $-1°$ L/R 11^{Δ}
20° to R. = $-1°$ L/R 27^{Δ}
20° to L. = $0°$ L/R 1^{Δ}

The cyclophoria is also well shown on the diplopia charts of the primary and secondary deviation, Figs. 2*a*, 3*a*. These were self-recorded on a device (the diplometer) whose design is as yet experimental, but which utilises complementary colours in the same way as the Hess screen[9], and the Lancaster projection lamps[14]. The fixation is therefore macular, and the strips represent the actual position of the eyes and not of the false images.

The fixation distance is 25 cm. and the maximum field of 15°. This area was chosen as the head begins moving in a normal person if the eyes move beyond 12° from the primary position.[4 12]

Operation, February 16, 1946. Under a retrobulbar anaesthetic the left inferior oblique was tenotomised close to the globe by the approach used by Dunnington,[3] and later White[20] and Guibor.[8] The technique described by Wheeler was employed to expose and advance the superior oblique.[19] This proved to be

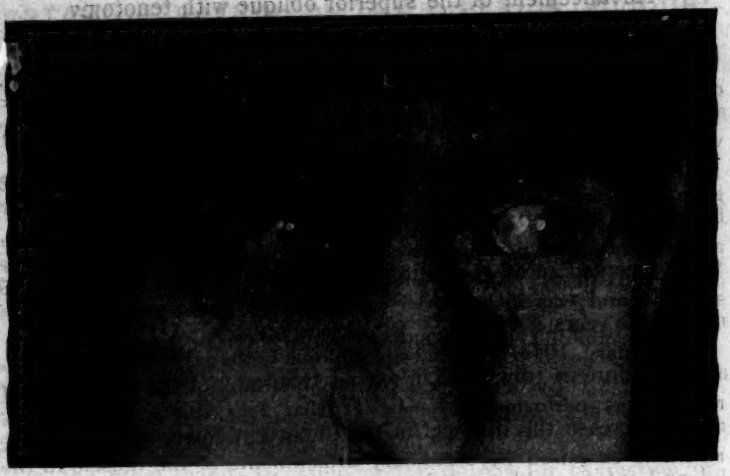

FIG. 1.

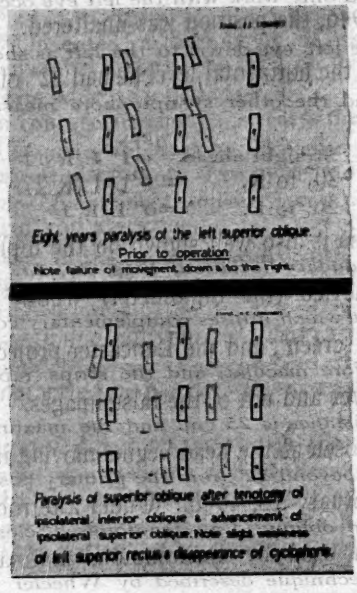
Eight years paralysis of the left superior oblique.
Prior to operation.
Note failure of movement, down & to the right.
Paralysis of superior oblique after tenotomy of
ipsilateral interior oblique & advancement of
ipsilateral superior oblique. Note slight weakness
of left superior rectus & disappearance of cyclophoria.

FIG. 2*a* and 2*b*.

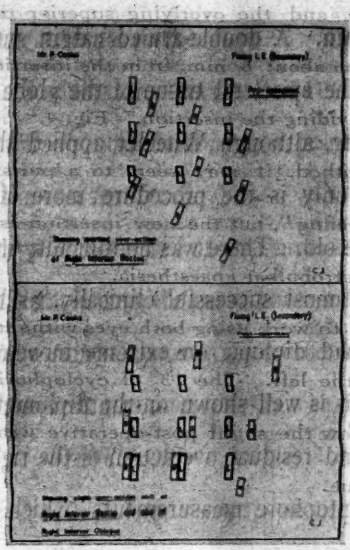

FIG. 3*a* and 3*b*.

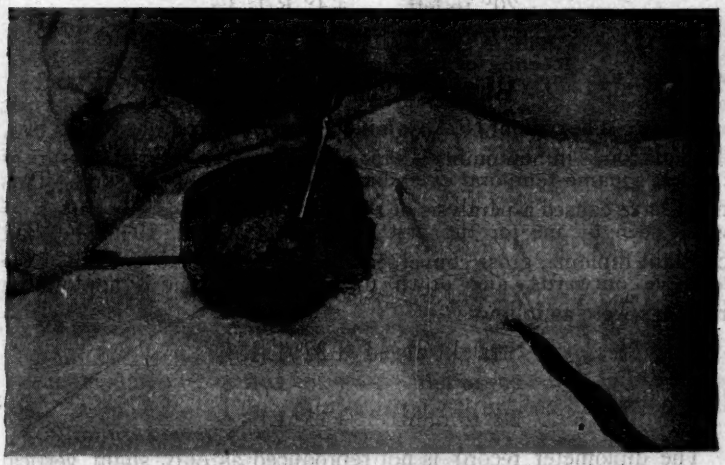

FIG. 4.—EXPOSURE OF THE SUPERIOR OBLIQUE.

The hook is under the superior oblique. The thread on the left is through the stump of the superior rectus. The thread held in the forceps is through the free end of the superior rectus.

surprisingly large, and the overlying superior rectus (which was divided) rather thin. A double-armed catgut suture was inserted through the tendon about 6 mm. from the insertion, and this point was attached to the episcleral tissue of the globe in the line of the muscle without dividing the insertion. Fig. 4.

Strictly speaking, although Wheeler applied the term advancement to this method, it may seem to a purist somewhat of a misnomer. Not only is the procedure more of the nature of a "tucking" or "reefing", but the new insertion is further back on the globe than the old. There was no difficulty in carrying out the operation under retrobulbar anaesthesia.

The result was most successful clinically, as by March 12, the man had returned to work using both eyes without prismatic correction. He only had diplopia on extreme movement down to the right, and up to the left. The 13° of cyclophoria had completely disappeared. This is well shown on the diplometer charts *2b* and *3b*, which also show the slight post-operative weakness of the left superior rectus, and residual overaction of the right inferior rectus and inferior oblique.

The final synoptophore measurements (which have not altered since) were:—

Straight ahead	+3° L/R 2△
20° to right	−2° L/R 4△
20° to left	+4° R/L 3△

Reefing of the superior oblique with Hummelsheim's operation

Case 2. The patient (F.A.) a miner, aged 21 years, was buried by a "fall of stone" in September, 1945, which caused a fissured fracture of the left squamo-temporal extending into the base of the skull. This must have caused a paralysis of the left fourth and sixth nerves, as when seen by me for the first time on May 7th, 1946, he had constant diplopia, gross convergence, with limited movements of the left eye outwards, and down to his right. The synoptophore readings were as follows:—

Straight ahead	+22° L/R 6△
20° to left	+26° L/R 8△
20° to right	+15° L/R 6△

The diplometer record is not reproduced as only slight vertical and torsional errors are shown in it.

Operation on the left eye, May 23, 1946:

(*a*) 6 millimetre recession of internal rectus.

(*b*) Suture of the outer half of the superior and inferior recti to the insertion of the external rectus.

The original Hummelsheim technique[11] was employed (it should be noted that variants of this are described as O'Connor's or Temple-Smith's operation).

(*c*) The superior oblique tendon at a point 6 mm. from its insertion was sutured to the insertion itself, and a further suture inserted to hold the reef firmly.

These procedures were carried out simultaneously under local anaesthesia. Only the outer half of the superior rectus was freed in this case.

The result is still improving, the patient has simultaneous binocular vision everywhere, except to the right, though a slight torticollis compensates a restriction of the internal rectus, when staring fixedly straight ahead.

The synoptophore readings on September 18, 1946:—

Straight ahead $= 0° \frac{0}{0}$ Nil

20° to left $= 0° \frac{0}{0} -$ Nil

20° to right $= -11°$ R/L 6^{Δ}

In view of the continuing improvement it was decided not to perform a partial re-advancement of the left internal rectus.

Recession of the superior oblique

Case 3. Feb., 1946. The patient J.A.B., a woman aged 68 years, fell on to a key protuding from a chest of drawers. A deep wound was produced in the left lower fornix and the divided inferior rectus sutured. By June, 1946, a gross limitation of the action of the inferior rectus was present with diplopia.

The synoptophore readings were:—

Straight ahead $= -3°$ L/R 16^{Δ}
20° to left $= -3°$ L/R 19^{Δ}
20° to right $= -3°$ L/R 12^{Δ}

The patient proved unsuitable for a diplometer test.

June 28: Exploration revealed that the muscle was attached to the globe, but surrounded by massive fibrosis adherent to the orbital rim. A good deal of this fibrous tissue was excised or divided, with slight improvement which was only temporary.

July, 1946. Synoptophore readings:—

Straight ahead $= +3°$ L/R 12^{Δ}
20° to left $= +6°$ L/R 16^{Δ}
20° to right $= +2°$ L/R 8^{Δ}

Operation, August 1, 1946. An 8 mm. recession of the right superior oblique was performed under local anaesthesia after temporary division of the superior rectus. This, of course, implies a movement of the oblique insertion forwards and inwards. After the operation it was decided that the inward movement was slightly greater and the forward movement less than the ideal. The result was reasonably good, however, the patient obtaining single binocular vision without prisms everywhere except to the left, where the divergence prevents it. Synoptophore readings on September 7, 1946, were as follows:—

Straight ahead = 0° L/R 2△
20° to left = −10° L/R 9△
20° to right = 0° R/L 3△

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INFLAMMATORY JUGULAR PHLEBOSTENOSIS AS THE CAUSE OF GLAUCOMA EXOGENICUM*

BY

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THE term "glaucoma exogenicum" is introduced to differentiate this type of glaucoma with extra-ocular cause from "glaucoma endogenicum" that has an intra-ocular cause. Both types of glaucoma are secondary in nature.

Just as retinitis albuminurica has its cause outside of the eye, exogenic glaucoma has an extra-ocular cause.

* Received for publication, July 10, 1946.

The cause of exogenic glaucoma was traced clinically by the author to a jugular phlebostenosis due to proliferative endophlebitis. It is desirable that pathologists examine the jugular veins of patients who die with exogenic glaucoma.

The author stressed in two papers the importance of inflammatory phlebostenosis of the jugular veins as the cause of the so-called "primary" glaucoma.

It is important to have a clear conception of the rôle which the internal jugular vein plays in the drainage of venous blood from the head region.

The bulk of the blood entering the head is drained off by the internal jugular veins on each side of the neck. A relatively small amount of venous blood passes through the external jugular veins. A very small portion returns by way of the suboccipital plexus into vertebral and deep cervical veins, and from there into the innominate vein.

The factors which promote the circulation in the veins are muscular contractions, gravity for the venous circulation above the level of the heart, suction exerted upon the heart and larger thoracic veins during expiration, and action of the right heart.

Haemodynamically it is a fundamental law of the circulation that the blood flows always from a point of higher pressure to a point of lower pressure. The point of zero pressure, *i.e.*, where negative and positive pressures just balance one another, is in case of the upper part of the body in the jugular vein at the root of the neck. Below this point the pressure is negative. For this reason there is supposed to be danger, should a vein be nicked in this region during an operation, of air being sucked in and carried to the heart. The negative pressure varies between minus 35 and minus 80 mm. of water at the right auricle.

The jugular vein has no valves and only two coats. The media is entirely lacking.

The negative pressure at the right auricle is an important factor for the drainage of the venous blood from the head area. Any resistance to the free flow of venous blood between the head area and the right auricle must increase the venous pressure in *all* distal veins in the head area. Haemodynamically any resistance to the flow of the blood influences the slope of pressure which is a deciding factor for a free flow of blood. The greater the slope of pressure, the better is the circulation.

A normal lumen of the endothelium of the internal jugular vein is the *conditio sine qua non* for a normal drainage of venous blood through the jugular vein.

Proliferative endophlebitis was described by Ceelen, Levin and Bucy, and Martin and Tull on the basis of biopsies. These authors

agree that proliferative endophlebitis decreases the diameter of the lumen considerably and therefore must interfere with the return of the venous blood. Ceelen called this stenosing type of phlebitis " phlebitis productiva angustans " to express the considerable narrowing (angustation) of the lumen. He stressed the fact that the proliferation of the venous endothelium—and not the formation of thrombi—interferes with the venous return. The coarctation of the lumen which narrows it to a large degree is caused by the inflammatory changes in the endothelium.

Greifenstein, Fraenkel, and Waldapfel have stressed the excessive swelling of the endothelium in jugular veins. Waldapfel stressed this factor by illustrating his paper with an illustration showing by comparison the thickness of a normal jugular vein and the enormously increased thickness of an inflamed vein under the same magnification. Kaufmann, according to Greifenstein, found the thickening of a wall of an inflamed vein sometimes ten times as thick as the normal vein.

Any blockage of a proximal vein interferes with the drainage of all distal veins. This fact was proven experimentally by von Kries, MacMaster and Hudack.

Phlebostenosis in proximal veins increases the intravenous pressure in all distal veins. The result is a diminution of the slope in pressure and therefore an interference with the venous return.

Seidel, on the basis of tonometric and manometric experiments, proved that the pressure in the anterior chamber of the eye is considerably higher than the pressure in the episcleral veins which drain the veins of Schlemm's canal. He found in rabbits a normal intra-ocular pressure of 25-28 mm. Hg, while the pressure in the episcleral veins was only 7-11 mm. Hg.

Duke-Elder in a paper on the venous pressure and its relation to the intra-ocular pressure, found that the pressure in the veins immediately at the exit from the sclera was considerably lower than the intra-ocular pressure. The difference was about 7·2 mm. Hg.

The difference in the higher pressure of the anterior chamber and the lower pressure in the episcleral veins is the deciding factor for the normal drainage of the aqueous humour through the veins of Schlemm's canal.

The smallest veins in Schlemm's canal result from a fusion of a variable number of capillaries.

Hiroishi proved experimentally the direct relation between the venous system and intra-ocular pressure He withdrew a certain amount of the transparent aqueous humour and replaced it with exactly the same amount of an isotonic suspension of very fine

dyestuff particles that would enable him to observe the appearance of this dyestuff suspension in Schlemm's canal and the episcleral veins. In order not to stain the inner lining of the veins he used a non-diffusible dyestuff. He observed that this dyestuff would appear in Schlemm's canal and in the episcleral veins when the pressure in the anterior chamber was 20 to 25 mm. Hg. He further observed that pressure on the jugular vein stopped the drainage of the dyestuff suspension from the anterior chamber completely. He came to the conclusion that congestion in the episcleral and vortex veins would lead to a considerable increase of the venous pressure in the episcleral veins and in the veins of Schlemm's canal.

Schoenberg constructed a special cuff for the compression of the jugular veins of his patients and came to the conclusion: "One thing is certain: 'the intra-ocular pressure is altered under the influence of compression of the jugulars'."

Local chronic inflammation of the veins of Schlemm's canal and of the vortex veins has been described by Birnbacher and Czermak. They described proliferative endophlebitis which narrows the lumen and interferes with the return of the venous blood. The question if these changes are due to augmented venous pressure or to allergic inflammation in a congested tissue does not enter our discussion.

Max Kinis also described inflammatory changes in Schlemm's canal and came to the conclusion that the main disturbance is to be found in the changed outflow of venous blood.

Besides changes in the slope of pressure the accumulation of CO_2 in blood vessels with venous congestion increases the viscosity of the blood and interferes with the normal flow of blood, especially in the capillaries.

The hereditary factor plays a great rôle in glaucoma, and it may be that this factor is often important for the pathogenesis of glaucoma. Circulatory disturbances affect primarily an organ that is weak due to hereditary factors. An example is arthritis. In arthritis we find in nearly all cases inflammatory phlebostenosis in the proximal veins which is responsible for circulatory disturbances and functional changes, and, in the later stages, for structural changes of a joint.

Since Graefe in 1855 recognised the increased intra-ocular pressure in glaucoma, all efforts were directed to local pathology in the eye. Regional pathology did not enter glaucoma research at all. This type of pathology was neglected especially in disturbances within the head region. In a paper on the syndrome of latent jugular phlebitis Meyer, in 1937, called attention to the importance of venous congestion in the head area due to impairment of the venous return in the coarctated jugular veins.

From a therapeutic point of view it is important to know the starting point for jugular vein infections. Fraenkel, Siegmund, and Colby Hall described pathologically the spreading mechanism of *acute* tonsillogenic, dentogenic, and pharyngogenic infections *via* the small connective veins into the jugular veins *per continuitatem*. It is obvious that chronic oral infections must have the same spreading mechanism. Lately the fact of bacterial phlebotropism has been stressed by Meyer in order to express an affinity of bacteria for the endothelium of the veins.

The starting point in oral focal infections is nearly always an infection in the small tonsillar veins and a thrombophlebitis in the small veins of the dental pulp.

Siegmund and Roessle found pathological changes in the small tonsillar veins, while Wassmund and Bingold stress the importance of thrombophlebitis in the pulp as the starting point of dental focal infection.

Experimental proof of this important factor should be easy. Hueper was able to produce experimental jugular phlebitis in dogs by infecting the pulp canal with streptococci. Since the dental pulp according to Bremer has no lymphatic vessels, it is obvious that pulp infections can only spread by way of the small pulp veins.

It is imperative to eradicate primary oral foci completely in order to avoid a reinfection of the jugular veins from these sources. Root fragments and tonsillar stumps are especially dangerous, as they lack drainage to the mouth cavity.

I described the frequency, the danger, and the diagnosis of infected tonsil remnants lately in a paper on the incidence and significance of tonsil remnants.

After complete removal of the primary oral foci, the jugular endophlebitis persists in nearly all cases as an independent infection. The treatment of jugular phlebitis with leeches is empirical and was applied by Meyer after he had such excellent results with leeches in the treatment of purulent phlebitis in the lower extremities.

Leeches were used by ophthalmologists for a long time in glaucoma cases. But all of them applied leeches over the temple region in glaucoma patients. This application could result only in a local temporary decongestion of the eye.

Recalibration of the jugular veins with leeches, on the other hand, brings on a total decongestion of the whole head area, and therefore has a permanent therapeutic effect.

Summary

Glaucoma exogenicum has its cause outside of the eye in chronic proliferative endophlebitis of the jugular veins.

Jugular endophlebitis has a narrowing effect on the vein lumen which interferes with venous drainage of the head region.

Blockage of the proximal jugular vein produces an increase in venous pressure in *all* distal veins, including the episcleral veins which drain the veins of Schlemm's canal.

The deciding factor for a normal drainage of the aqueous humour from the anterior chamber is the difference of the higher pressure in the anterior chamber and the lower pressure in the veins of Schlemm's canal and the episcleral veins. If the venous pressure of the veins in Schlemm's canal and the episcleral veins equals or exceeds the intra-ocular pressure, the slope in pressure is eliminated, and the drainage of the anterior chamber is stopped completely.

The treatment of exogenic glaucoma resolves itself into a recalibration of the jugular veins.

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OCULAR LESIONS IN INTERNEES AT A CIVILIAN INTERNMENT CAMP AT HONG KONG*

BY

H. TALBOT

HONG KONG

AMONGST the inmates at a Civilian Internment Camp at Stanley, Hong Kong, a number of ocular symptoms were observed during the Japanese occupation. The general conditions prevailing in the camp were none too good. Food was not plentiful; there were only two meals a day. After about the first year in camp meat was not included in the dietary, except on three or four occasions. Towards the last month of internment water-buffalo (? horse) was supplied. Fish, usually as fresh raw fish, or as dried-salted, was not frequently given, and when supplied it was always in small quantities.

During the three and three-quarter years' internment everybody received four Red Cross parcels; a number of internees, perhaps 40 per cent. in the early days dwindling to 10 per cent. or less later on, received parcels of food from friends (Chinese and third Nationals) living in Hong Kong. In the early days it was possible to augment the rations with food bought at the canteen,

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but these extras ceased with the growth of the black market—run by the Japanese guards through their British contacts, internees in the camp. In the last six to nine months of internment, the black market prices became so prohibitive that most people were unable to obtain any extra food.

Two hundred and seventy-eight internees (designated Group A) developed obvious ocular symptoms for which they attended the eye clinic, or were referred to it by the Nutrition Clinic attached to the camp. To assess the significance of these symptoms 111 consecutive patients attending the Nutrition Clinic for some deficiency condition, but not complaining of ocular symptoms, were studied as a control series (designated as Group B). Field defects and subjective symptoms were the outstanding conditions observed.

1.—Field defects

In the 278 patients with ocular symptoms the most constant objective finding was constriction of the peripheral fields for white, red and black. In a few cases the fields for white were so constricted that only a small central area of vision was left, and the patients stated that they seemed to be looking through binoculars. In such patients no field for black or red could be determined at all. These cases are, therefore, similar to those described by Wilkinson and King where central or paracentral scotoma to white, black or red was the exception, whilst loss of the peripheral field was outstanding. In no case was there contraction of the field for white without concomitant contraction for red, or red and black, and no case showed contraction for black without an equally or greater contraction for red. The field for red was always the first to be affected, and with increasing contraction of the red field, field defects for black and white became apparent. The following table (Table I) shows the percentage distribution of field defects in this group.

TABLE I

Colour	Contracted	Normal
Red alone	85 (31 per cent.)	—
Red and black	193 (69 per cent.)	
White	227 (82 per cent.)	51 (18 per cent.)

In patients with ocular symptoms contraction of the field for red, or red and black, was therefore a constant feature, whilst no less than 82 per cent. of such patients showed contraction of the field for white.

There was also a considerable incidence of field defects in the control series of 111 cases. The percentage distribution is shown by the following table.

TABLE II.

Colour	Contracted	Normal
Red Red and black	88 (79 per cent.)	23 (21 per cent.)
Red alone	47 (42 per cent. of total)	—
Black and red	39 (35 per cent. of total)	—
White	48 (44 per cent.)	63 (56 per cent.)

Central scotoma for colours was rare. There were seven cases in Group A and none in Group B.

2.—Fundus lesions

In Group A the commonest finding was pallor of the lower temporal quadrant of the disc, which in progressive cases extended so that ultimately it gave a typical picture of optic atrophy.

Only two patients in the control series were examined, and of these one showed pallor in the lower temporal quadrant of the disc.

3.—Conjunctival lesions

In Group A conjunctival involvement was fairly common, mainly in the lower palpebral conjunctiva and fornix giving a picture not unlike that of spring catarrh. Only occasionally were the upper fornices involved. Xerosis was present in a number of cases wih Bitôt's spots in twelve patients. Mild circumcorneal injection, not unlike a mild iridic injection, was seen in a number of cases.

4.—Subjective symptoms

(*a*) *Headaches.* In 177 patients in Group A (64 per cent.) headaches occurred as frontal, occipital, bulbar and retrobulbar ache. There did not appear to be any general relationship between the headaches and objective findings, except that in the more advanced cases the headaches were constant.

(*b*) *Disturbances in visual perception.* These took the form of " flicker " or movements of objects, and referred to by the patients as a " jumping " or " jiggling " of the letters, etc., of " seeing objects as through a mosquito net " or " through a window-pane

covered with rain drops," "objects come into focus, then disappear," "they come and go," etc. Movements at the periphery of the field occurred in some instances.

(*c*) *Temporary loss of vision.* Sixteen patients in Group A (6 per cent.) had temporary loss of vision lasting for a matter of minutes to half an hour. On examination nothing abnormal could be detected ophthalmoscopically. The degree of loss of vision varied: in every case it was unilateral and was in only three cases complete for the affected eye. In the others, only "parts of objects" were seen and after a short period, the vision cleared and the complete object was discernable. All of these cases examined objectively showed some contraction of the fields for white and colours, and some temporal pallor of the disc.

(*d*) *Night blindness.* This was a common feature and in a number of cases led to minor injuries—the patients walking into objects or tripping over stones and steps. One patient with restricted fields and marked night blindness was constantly running into things.

(*e*) *Impaired central vision.* This was surprisingly exceptional. In Group A only 47 had visual acuity of less than 6/12 with the two eyes together. In Group B 23 patients had impaired central vision.

(*f*) *Glare.* This was a common complaint in both groups.

(*g*) *Eye strain.* This, and the symptoms of headaches appear to go together. Fatigue of the external muscles showed itself by such complaints as heaviness of the lids presumably from inefficiency of the levator palpebrae superioris. Patients found themselves unable to keep their lids open, and were actually seen supporting their upper lids, particularly towards the end of the day. In two patients a marked ptosis developed, which improved after injections of thiamin.

Treatment

In Group A seven patients were treated with riboflavin, 5 mgm. daily for 30 days. There was no improvement in any of them objectively, but five patients stated that they felt much better in themselves. It seems probable that the dosage was much too small but it represents practically the total amount of riboflavin that was available. Patients were treated with nicotinic acid, thiamin, shark liver oil and yeast—either singly or in combination. But no one therapeutic agent effected any marked improvement. The doses tended to be small because of the small quantities available and proteins and fats were lacking. The patients who seemed to benefit most were those who were in a position to obtain eggs and fats and there were some instances of quite dramatic

improvement where visual acuity had gone down to 6/60 and fields were contracted down to around the central area. After a course of eggs and fats visual acuity improved to 6/12. About half the cases (Group A) were given yeast daily, but it was recognised as of poor therapeutic quality.

An earlier series of cases had been treated with foods of high protein and vitamin content (eggs, liver paste, peanut butter). These patients subsequently came under the care of the present writer. Some showed a further slight improvement, but the majority remained unchanged, and a number deteriorated.

From a survey of the periodic examination it would seem that the objective findings when the patients first presented themselves were more or less the maximum of involvement, with a tendency to slow deterioration.

The presence of avitaminosis and gross nutritional deficiency in all these cases leads to the suggestion that aetiologically the ocular symptoms were of nutritional origin. These symptoms did not seem to depend on the absence of any one particular vitamin, but rather to an imbalance with or without an absolute lack of either vitamin A or B1 or B2 complex. Closely associated with the abnormal balance of vitamins in the diet was the lack of proteins and fats and absence of these, too, doubtless played their part in producing the final clinical picture.

Taken as a whole the ocular symptoms, particularly the field defects, suggest that primarily the lesions observed—whatever their cause—were retinal in origin rather than nerve lesions. Such a reading forces itself from a study of the field defects.

I take this opportunity of thanking and placing on record the able work and the immense patience shown by Mr. W. C. Walker (Hong Kong Govt. Dept.) who, over a period of about three and a half years in the camp, carried out practically all the examinations of the fields.

BILATERAL PARTIAL COLOBOMA OF THE OPTIC NERVE

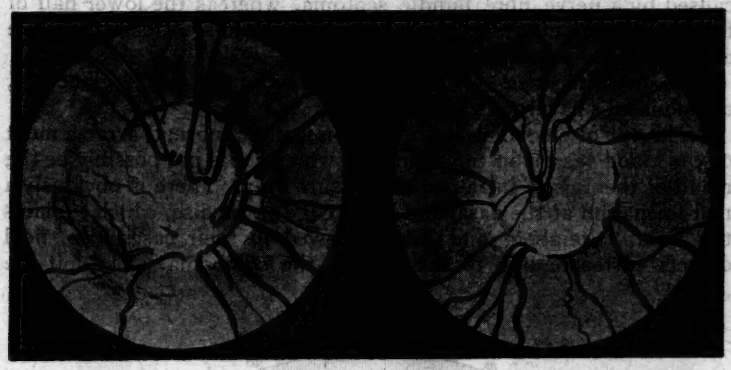
BY

JOHN A. MAGNUS

YORK

COLOBOMA of the optic nerve, without involvement of the choroid, is such a rare condition that I feel justified in adding this case to those odd fifty already reported in the literature which was recently reviewed by T. Steinberg of San Francisco.

David V., aged 19 years. He stated that the right eye was always bad. It started to show divergence at the age of three, following whooping cough. He has never experienced any difficulty in seeing at night, or in the "black-out" during the war.



Right eye Left eye

Both eyes show coarse, horizontal nystagmus, especially when looking towards the extreme right or left-hand side. The right cornea is smaller than the left one.

R. V. With + 2·0 D.sph. = 6/60

L. V. with $\frac{+ 1{\cdot}25 \text{ D.sph.}}{+ 1{\cdot}0 \text{ D.cyl.} \rightarrow 180^{\circ}}$ = 6/9 to 6/6 (2 letters)

The right disc is at least twice the normal size, deeply cupped below and at the nasal side, where its colour is a bluish-grey, but the lamina cribrosa is not visible. The central and upper parts of the disc show a normal pinkish colour, and no cupping. The edges of the disc are sharply defined, except for the temporal margin. The upper branches of the central retinal vessels emerge a little above the centre of the disc, whereas the lower branches emerge at the circumference of the disc, and bend sharply around its edges. The right fundus is otherwise perfectly normal.

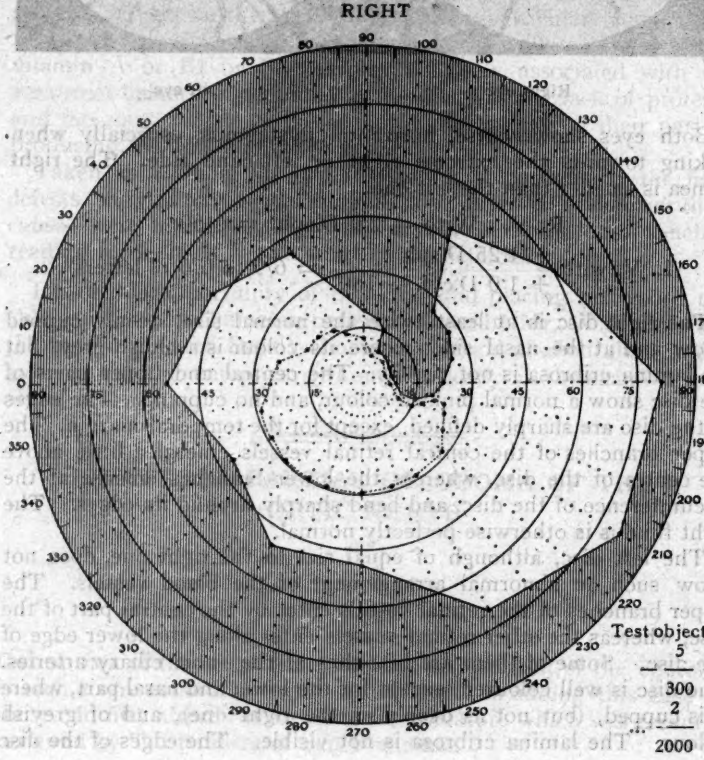
The left disc, although of equal size to the right one, does not show such an abnormal arrangement of the blood vessels. The upper branches of the retinal vessels enter by the central part of the disc, whereas the other retinal vessels enter along the lower edge of the disc. Some of them are branches of the short ciliary arteries. The disc is well coloured, except for the lower and nasal part, where it is cupped, (but not as deeply as the right one), and of greyish colour. The lamina cribrosa is not visible. The edges of the disc

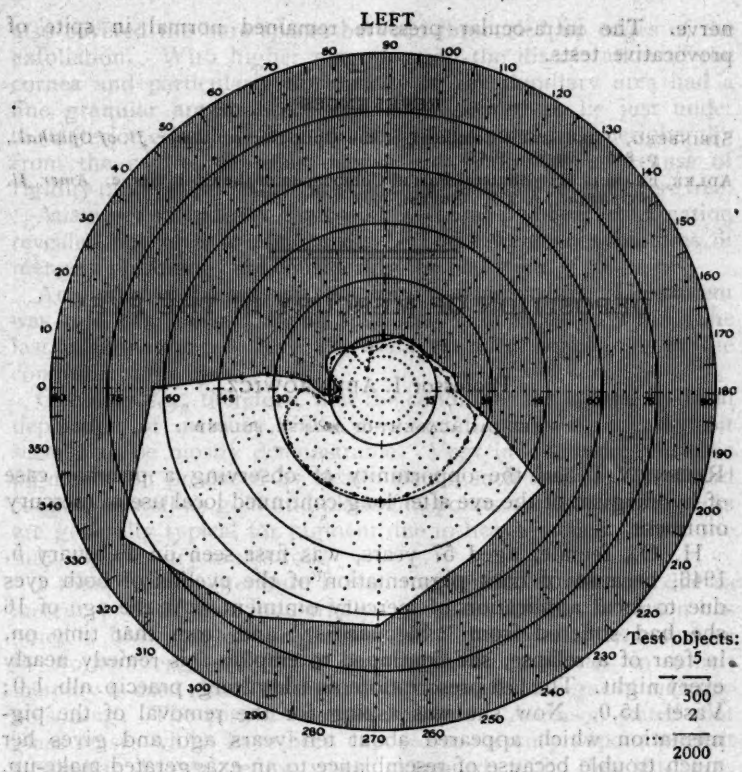
are well defined. The left fundus is otherwise normal. The intra-ocular pressure is normal, right 22, left 19 mm. Hg, and does not rise after dilating the pupil with homatropine, nor after keeping the patient in the dark-room for one hour.

The visual field of each eye shows a marked depression above, caused by a nerve fibre bundle scotoma, whereas the lower half of the field is perfectly normal. These field defects correspond to the deeply cupped parts of the disc.

The question arises—is this a coloboma of the disc, a glaucoma, or Schnabel's cavernous atrophy ?

In favour of coloboma is the anatomically abnormal arrangement of the blood vessels in the right eye, which could not possibly be the result of the raised intra-ocular pressure only. There is obviously a mal-formation at the nasal and lower edge of the disc, which explains the field. Steinberg and Adler showed in their cases also, field defects corresponding to the area of the coloboma. The left eye





does not look so much like a coloboma, although the lower vessels look definitely aberrant. The cupping is in the nasal half and not in the temporal one, as is usual in glaucoma. Against glaucoma, and in favour of coloboma, is the normal intra-ocular pressure, which did not rise after one hour's stay in the dark room, nor after instillation of homatropine over a period of two hours. I was not able to do a dark adaptation test, but the patient stated that he had never experienced any difficulty in the black-out.

The field defect corresponds exactly to the defect in the optic nerve. There is no nasal step, which one would expect in a glaucomatous field.

The possibility of Schnabel's cavernous atrophy has to be answered in the negative, as these cases usually occur in late adult life.

Summary

A case of bilateral, partial coloboma of the optic nerve is presented, showing field defects which correspond to the defect in the optic

nerve. The intra-ocular pressure remained normal in spite of provocative tests.

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DEPOSITION OF MERCURY IN THE EYE*

BY

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RECENTLY I had the opportunity of observing a peculiar case of hydrargism of the eye after long-continued local use of mercury ointment.

H. O., female, aged 57 years, was first seen on February 5, 1946, because of dark pigmentation of the eyelids of both eyes due to local application of mercury ointment. At the age of 16 she had suffered from "blepharitis" and from that time on, in fear of a relapse, she continued to employ this remedy nearly every night. The last prescription ran: Hydrarg. praecip. alb. 1,0; Vasel. 15,0. Now she was asking for the removal of the pigmentation which appeared about ten years ago and gives her much trouble because of resemblance to an exaggerated make-up.

The two eyes were in about the same condition. The skin of the eyelids was bluish-grey. The conjunctiva showed moderate hyperaemia. Some loose dark particles were in the conjunctival sac. The cornea and lens, observed under oblique illumination, were quite normal. Ophthalmoscopically the media were perfectly transparent. Visual acuity was normal.

Slit-lamp examination revealed dark pigment granules in the bulbar conjunctiva, especially near the cornea, with preferential distribution around the perivascular lymph vessels. In the periphery of the cornea in the region of Descemet's membrane a discoloration, varying from a greenish-grey to a bluish-grey, was seen. A yellowish-brown lustreless opacity occupied the pupillary area of the lens. Changing of colours was absent. Near the lower pupillary border there was also seen a capsular separation of the senile type of exfoliation. The brownish opacity

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also covered the bare spaces between the curled up edges of the exfoliation. With higher magnification the discoloration of the cornea and particularly the opacity in the pupillary area had a fine granular appearance. The latter seemed to lie just under the anterior capsule. Any radiating lines extending peripherally from the central capsular deposit were not visible because of rigidity of the pupil. The cortex and the posterior capsule were free.

Anamesis excluded a chalcosis. General physical examination revealed no signs of abnormality. There were no symptoms of mercury poisoning, not considering the bad teeth.

An ointment of 1 per cent. noviform was prescribed. The patient was told the remedy, being harmless, influences as well. The last examination on May 29, 1946, revealed no change in the condition of the eyes.

One may say, therefore, that the condition was caused by local deposition of mercury. The fine equal grains of the deposit seemed to be mostly demonstrable. Vogt in discussing metallic pigmentation produced by heavy metals such as iron, silver and copper, as well as gold and platinum, points out that these grains are generally typical for pigment due to heavy metals. Now one may add mercury to this roll.

I found in the literature a report of lenticular changes due to mercury, which arise industrially (Atkinson, 1943). Atkinson has noted a brownish coloured reflex from the anterior lens surface in workers engaged for a long time in industries in which mercury is used although they may show no other signs of mercury poisoning. The cornea was not involved. Atkinson stated that glass lenses which have been exposed to mercury vapour present a similar brown reflex when examined with the slit-lamp. Atkinson believes the reflex from the lens is caused by deposition of mercury on or in the anterior capsule. The reflex is suggested as an early diagnostic sign of chronic mercurialism. In this connection the above-mentioned case seems to be of some significance.

Summary

A case of deposition of mercury in the eyelids, the bulbar conjunctiva, the region of Descemet's membrane, and anterior lens capsule after long-continued local application of mercury ointment is described.

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ANNOTATIONS

A case of mistaken identity

Brudenell Carter, in one of his books, tells the story of his having once been asked by a friend in practice in the country to go down and extract a cataract in one of his patients. Carter's reply was characteristic: "I never promise to undertake an operation in a case I have not previously examined, but I will come and see your patient, prepared to operate if I see fit." The doctor friend felt rather sore and told Carter that he thought he might have trusted his diagnosis. When Carter examined the patient he found that his friend had been misled by the grey reflex from the pupil of an aged patient and that the lens was still quite clear.

This is the sort of mistake to which most of us can plead guilty in our early student days; but having once made the error and having had it pointed out to us with emphasis by the Chief Clinical Assistant few of us are likely to fall a second time.

It is an easy error into which to fall for anyone who has had little or no ophthalmic training. We recall a young woman coming to outpatients many years ago from a home for the partially blind. She brought a half sheet of notepaper with her on which a doctor had noted his opinion that the removal of the lens or lenses might be expected to improve her sight. We were unable to agree with this proposition, for the patient was a very obvious congenital syphilitic and the opacities which he had seen were in the cornea, a result of interstitial keratitis, and not in the lens.

A classical Spoonerism

All the original Spoonerisms to the best of our knowledge were spoken aloud. Many of them were apocryphal. One can understand anyone occasionally mixing up syllables with incongruous results. 'Kinkering Congs' for 'Conquering Kings' is a good example of what is meant. Whether Cicero or any of the other great Roman orators ever fell into this sort of pitfall is unknown and we should not have thought it worth while to occupy our space with these observations had it not been that in reading an ophthalmological article in an American published journal we came across the specimen which we label a classical Spoonerism. It was *Vix Mediatris Naturae.* This seemed to us all wrong but remembering our prep. school master's dictum, that as a boy we were unable to translate the simplest Latin sentence, we approached one of the rising generation, aet, 10½; a potential scholar, and asked him what he made of it. He seemed nonplussed, so we suggested looking the

words up in the dictionary. On doing this we found that the word *vix* meant "with difficulty". *Naturae* was easy enough as the genitive of *natura*, but *mediatris* had us floored. And then as we were wondering whether we should visit Sion House to consult the Vulgate and see if the 'How hardly shall those with riches enter the Kingdom' etc., was rendered *vix*; we suddenly thought of Cullen and his *Vis Medicatrix Naturae* and the problem was solved without any *vix* at all.

We fancy the error was due to the compositor in the first place with faulty proof reading in the second.

SOCIÉTÉ BELGE D'OPHTALMOLOGIE

THE Fiftieth Anniversary Meeting of the Société Belge d'Ophtalmologie was held in Brussels on September 28 and 29, 1946. It was most satisfying to note that many ophthalmologists from this country attended the Meeting. These included Messrs. Black, Cashell, Cridland, Doggart, King, and Law (the official delegate), Mrs. Miller, Mr. C. Muirhead, Miss Pugh, Mr. Lindsay Rea and Mr. Eugene Wolff.

The Congress opened with an inaugural session in the Marble Hall of the Palais des Académies, which was honoured by the presence of Her Majesty the Queen Mother. Professor van der Straeten gave a presidential address; Professor van der Hoeve spoke on behalf of the foreign delegates. The death of Professor Coppez one month before the Congress was sincerely regretted by all those present, not least by his British colleagues, to whom his name had been one of the foremost in Belgian ophthalmology for so long. He was to have given an account of the activities of the Society since its foundation; his paper was read by his son, Dr. Léon Coppez. The proceedings closed with a paper by Dr. Alaerts on "L'oeil humain dans l'Art", after which the official delegates, amongst others, had the honour of being presented to Her Majesty.

In the evening the banquet was held in the Hôtel Métropole; there was a large gathering, including a number of ladies. The proceedings were informal, but short speeches were made by the Chairman, Professor van der Straeten, the Hon. Secretary, Professor Appelmans, the official delegates and others.

The Congress was continued the next day at the Maison des Médicins. The morning was given over to "Conferences" by the official delegates, and the President, Professor Weekers, gave up the Presidential Chair to Mr. Wolff, who conducted the proceedings with dignity and no small linguistic ability. Professor Beauvieux (France) gave a paper entitled "La cécité apparente du nouveau-né";

Mr. Law (Great Britain) did his French best with a description of "L'ophtalmologie pendant la guerre"; Professor Zeeman (Holland) spoke on "Quelques affections des artères ciliares"; and Professor Amsler (Switzerland) on "L'humeur aqueuse, cette inconnue. . .". At the close of the morning session the delegates were each presented with the van Duyse Medal of the Society, and also received the great distinction of Honorary Membership.

The afternoon was occupied by "Communications," many of which were of outstanding interest. The list was as follows:—

1. J. Sedan and G. Farnarier (Marseille):—"Blessures oculaires de guerre de 1939 à 1944."
2. G. Renard (Paris):—"Trois cas de guerison de l'ophtalmie sympathique par les injections sous-conjunctivales de solufontamide."
3. E. Wolff (London):—"La couche huileuse du film précornéen."
4. G. P. Sourdille (Nantes):—"Précisions sur la technique des greffes cornéennes transfixiantes."
5. Henrique Moutinho (Lisbon):—"L'action vasodilatatrice rétinienne de l'acide nicotinique. Etude expérimentale et clinique." (Projections).
6. R. Onfray, Derot and Quentin (Paris):—"Rétinopathie hypertensive et diabète hypophysaire."
7. R. Lindsay-Rea (London):—"Two cases of retinitis of septic origin." (Projections).
8. S. Schiff-Wertheimer (Paris):—"Rétinite proliferante et clivages de la rétine."
9. G. Renard (Paris):—"Une forme spontanément curable d'efflorescence rétinienne maculaire probablement tuberculeuse." (Projections).
10. M. Pugh (London):—"A short account of orthoptic training."
11. G. E. Jayle (Marseilles):—"La biochemie de la production de l'humeur aqueuse."

In addition, two interesting operation films were shown by Professor Barraquer on detachment of the retina and extraction of cataract by suction.

Entertainment for the ladies was provided by a conducted visit to the Maison Chinoise at Laeken and the Musée Colonial at Tervueren, which was well attended and much enjoyed.

Monday, the 30th, was occupied by a visit to Antwerp. The company first visited the historic Maison Rubens, a mansion of much interest full of relics of the great painter. They were next shown round the beautiful Cathedral, which contains many impressive works of the master; lunch was taken at the Hôtel Century, Avenue de Keyser. In the afternoon they crossed the city by motor coach and visited the port, being given an extensive tour by

boat round the vast area of docks. A return to Brussels by electric train completed a most interesting and instructive day.

Such was the official part of the proceedings; but any account would be grossly incomplete which did not mention the private hospitality which was shown to many of us. A charming informal supper was given on the evening of Friday 29, by Dr. and Mrs. Schepens, where many old contacts were renewed. Dr. Hambresin's large luncheon party on the Saturday will long be remembered by those honoured with invitations; it was a sumptuous repast, the high light being a Vosne Romanée, 1923, served with fitting ceremony and imbibed with reverence and delight. Our Belgian friends have wine and serve it; what memories the very names evoked! Dr. Léon Coppez and Dr. Jean Coppez both entertained at lunch on Sunday, and the hospitality and friendly atmosphere were intensely enjoyed. It was a source of very great pleasure for visitors to be entertained in the houses of these Belgian colleagues—an intimate gesture which they much appreciated. In the evening the Honorary Secretary, Professor Appelmans of Louvain, gave a dinner party at the Restaurant Cordemans—a delightful occasion much enlivened by the pleasantries of Dr. René Onfray, Dr. Beauvieux and Dr. Sourdille.

One cannot speak too highly of the pleasure it gave to visit the Belgian capital once again. The welcome and hospitality were overwhelming; it was a Congress which will be ever remembered by those fortunate enough to be there. The post-war recovery is astonishing; the shops are full and the cafés crowded, the people are gay and charming. One looks forward to renewing one's memories and getting full scientific value by reading the Bulletin in due course, in which it is understood a complete account of both the academic and social activities is to appear.

British ophthalmologists acclaim their Belgian colleagues, and offer their congratulations and good wishes to the Société Belge d'Ophtalmologie on this auspicious occasion.

ABSTRACTS

I.—LENS

(1) **Reese, A. B. (New York).—Congenital cataract and other anomalies following German measles in the mother.** *Amer. Jl. Ophthal.*, Vol. XXVII, p. 483, 1944.

(1) **Reese** discusses Gregg's report about "Congenital cataract following German measles in the mother" published in the Transactions of the Ophthalmological Society of Australia about a severe

epidemic of German measles in Australia during the summer of 1940. In these cases and in the three reported by the author German measles was contracted during the first and second months of pregnancy. A dense nuclear cataract was present in one or both eyes. The anterior chamber was often quite shallow and the globe smaller than normal. The pupil responded badly to atropine and there was constitutional intolerance to this drug in many instances.

Other congenital anomalies noted in these cases were microcephaly, morbus cordis, deaf mutism, and retarded mental development.

H. B. STALLARD.

(2) **Wolfe, O. R., Wolfe, R. M. and Geogation, P. (Marshall Town, Iowa).—Discission of congenital (cataractous) dislocated lens.** *Amer. Jl. Ophthal.*, Vol. XXVI, p. 1313, 1943.

(2) **Wolf, Wolf and Geogation** describe the case of a boy, aged 6, with bilateral congenital dislocation of opaque lenses. The discission was effected by two needles, below a straight needle was used to transfix the lower pole of the lens, with the other needle, which was curved, a cruciform incision was made into the capsule and cortex. Vision 20/15 was obtained in both eyes.

H. B. STALLARD.

(3) **Guyton, J. S. and Woods, A. C. (Baltimore).—Oral use of prophylactic sulfadiazine for cataract extractions.** *Amer. Jl. Ophthal.*, Vol. XXVI, p. 1278, 1943.

(3) **Guyton and Woods** discuss the value of sulphadiazine as a prophylactic against intra-ocular infection after cataract extraction. Three grammes were given by mouth the night before operation and 1 grm. 3 hourly for 7 days after operation in 312 cases. Two control series were taken (1) 159 extractions performed with a technique similar to the test series and (2) 642 extractions, done with various technical differences, from 1926 to 1938. In the sulphadiazine series infection occurred in 1·6 per cent., in the first control series in 7·6 per cent., and in the second control series in 9·7 per cent. Powdered sulphadiazine was tried locally in the conjunctival sac but abandoned as it caused irritation.

H. B. STALLARD.

(4) **Kirby, D. B. (New York).—The development of a system of intracapsular cataract extraction.** *Amer. Jl. Ophthal.*, Vol. XXVII, p. 124, 1944.

(4) **Kirby** discusses technical modifications in the operation of intracapsular cataract extraction in order to deal with developmental and structural defects in the zonule, lens capsule and hyaloid membrane, and in dislocation of the lens. In the author's

surgical experience 15 per cent. of zonules are fragile, 70 per cent. have average resistance and the remainder have above the average resistance and resiliency. He found no age group into which these three classes fall, but observed early deterioration in certain Asiatic groups.

In rupturing the zonule the author applies pressure with the flattened point of a muscle hook at 6 o'clock before making traction and rotation of the lens. Then pressure is made successively at 8 and 4 o'clock, a slight stripping movement is used designed to slide down over the convexity of the equator and release the zonular fibres from their attachment. The pressure is rather sudden and sharp and varies in different cases, indenting the cornea 2 to 3 mm. When part of the zonule is ruptured it is easier to pick up the capsule with forceps. Preliminary pressure on the zonule is contra-indicated where there is increased intra-vitreous pressure as judged by gaping of the wound and repeated prolapse of the iris after replacement. The author favours Verhoeff's technique of grasping the lens capsule at 12 o'clock. He moves the forceps to 2 o'clock and makes counter-pressure with a flattened point at 8 o'clock and then to 10 o'clock with the forceps and 4 o'clock with the pressure point.

The author considers that 5 minutes should be sufficient to effect the delivery of the average cataractous lens.

In cases where the zonule is resistant the author uses his technique of stripping. The elbow of the lens-expressor hook is applied to the curved surface of the equator of the lens and the zonular lamella, which is under tension by being lifted with capsule forceps, is stripped from the equator in a clockwise and then counter-clockwise direction. The author stresses the importance of lifting the lens with capsule forceps away from the vitreous before stripping is done. If this is not done vitreous may be lost as indeed happened in only one case in a consecutive series of nearly 300 patients.

H. B. STALLARD.

(5) **Bischler, Vera.—Binocular vision in aphakia.** *Ann. d'Ocul.*, Vol. CLXXVIII, p. 273, 1945.

(5) **Bischler** contends that, although limitation of the visual field is admittedly a great disadvantage in uniocular aphakia, yet a still greater handicap is entailed by deprivation of binocular vision. In later life it is far less easy for a person to re-educate his spatial sense to conform with the uniocular state. Going down stairways, stepping-off kerbs, pouring liquid into a glass, and assessing the distance of vehicles, become difficult manipulations for an elderly uniocular subject who has been able to see stereoscopically for most of his life. Therefore operation on the second eye of patients

suffering from senile cataract is to be strongly advocated, unless the victim is very decrepit.

According to the author, many ophthalmologists erroneously suppose that stereoscopic vision is rare or impossible after a double cataract extraction. She, on the other hand, found that 50 cases of bilateral aphakia possessing equal visual acuity in the two eyes, but otherwise selected at random, achieved stereoscopic vision, with 3 exceptions. Of these exceptions, however, 2 had almost certainly never possessed that faculty, and the remaining subject was incapable of sufficient concentration to permit valid testing. The investigations on this series of 50 cases included estimation of visual acuity, both near and distant; examination by means of Worth's lights, the bar-reading apparatus, the Pugh orthoptoscope, and Bielschowsky's heterophorometer.

J. H. DOGGART.

II.—MISCELLANEOUS

(1) **Pino, R. H. and Hultin, G. L. (Detroit).—Treatment of asthenopia — non-pathologic and non-refractive in origin.** *Amer. Jl. Ophthal.*, Vol. XXVII, p. 520, 1944.

(1) **Pino** and **Hultin** studied 125 cases of asthenopia in patients who were not relieved by other means. There were no cases of muscular anomalies in this group. The ages of the patients were between 12 and 54 years. The authors gave orthoptic exercises to these patients on the principle that massage afforded relief to stiff, congested and painful muscles anywhere in the body. These exercises were given for 3 to 21 sessions. Seventeen of the 125 failed to respond satisfactorily to remedial exercises. The authors blame the patients' poor co-operation for this.

H. B. STALLARD.

(2) **Weiss, C. (San Francisco).—The geographical distribution of ocular infections.** *Amer. Jl. Ophthal.*, Vol. XXVII, p. 175, 1944.

(2) **Weiss** gives a table divided into 10 sub-sections each of which sets out the ocular diseases of a tropical and subtropical nature seen in these countries. This list is compiled with a view to helping medical officers in the fighting services engaged in theatres of war where these diseases are found. A list of 10 references is given.

H. B. STALLARD.

(3) **McKay, E. D. (M.C.) A.U.S.—New technique in orbit reconstruction following radical surgery.** *Amer. Jl. Ophthal.*, Vol. XXVIII, p. 1017, 1945.

(3) **McKay** describes the reconstruction of a socket after excision of an eye with the bulbar conjunctiva for squamous-celled carcinoma. The floor of the socket was treated with the heparinized serum of the patient. A split-skin graft was applied to a glass mould, with its raw surface outwards. This surface was painted with thrombin (5,000 units in 5 c.c. of isotonic saline) and the glass mould and graft inserted into the socket. The graft took satisfactorily and a prosthesis was fitted.

H. B. STALLARD.

(4) **Eggers, H. (M.C.) A.U.S. (Oakland, California).—A new type of enucleation implant.** *Amer. Jl. Ophthal.*, Vol. XXIX, p. 1015, 1945.

(4) **Eggers** maintains that an implant into Tenon's capsule after excision of an eye is less likely to be extruded if it is fenestrated so that fibrous tissue may entwine its skeleton structure. He used an acrylic implant with six windows, the framework being one-eighth of an inch thick.

H. B. STALLARD.

BOOK NOTICE

Bacteriological and Clinical Observations on the Treatment of the Acute Ophthalmias of Egypt with Sulphonamides and Penicillin. By BLAND, J. O. W. and WILSON, R. P., Cairo. Fourteenth Report of the Memorial Ophthalmic Laboratory, 1939-1946. Ministry of Public Health. Schindler's Press, Cairo. Price, 25 Pt.

Previous communications show that sulphapyridine is much more effective in the treatment of the acute ophthalmias than sulphanilamide, especially so in the case of Koch-Weeks infection. Of the newer drugs sulphadiazine and sulphathiazole are less toxic than sulphapyridine and as efficaceous. In the following research the criterion has been the bacteriological state of the conjunctiva, which is easily observable, and not any particular blood concentration. It was found that the bacteriostatic effect of both the sulphonamides and of penicillin persists long after the effective blood level has fallen below what is ordinarily considered to be required. Three principal points were elucidated:—

1. The effect of various sulphonamides on the pathogenic flora in the acute ophthalmias common in Egypt, the Koch-Weeks bacillus and the gonococcus.

2. The simplest method of curing these conditions and the most effective sulphonamide for the purpose.

3. The relative values of sulphonamides and penicillin in the treatment of these diseases.

The method of calculation of dosage was based on a dose of 0·5 gramme per 10 kilogrammes of body weight in the 24 hours. For convenience only two doses were given in this time. Lest it might be thought that this single dose is dangerously large it may be noted that it is practically the same as the usual 6-hourly dose designed to give a concentration of 5-10 mgm. per 100 c.c. of blood. In other words the total 24-hourly dosage was actually only half of that usually recommended.

Calculation of dosage according to bodyweight is not always practical so it was based on age, as follows:—

0-3 months	¼ tablet twice daily
3-6 months	½ tablet twice daily
6-12 months	¾ tablet twice daily
1 year	½ tablet twice daily
3 years	¾ tablet twice daily
6 years	1 tablet twice daily
10 years	1·5 tablets twice daily
20 years	2·5 tablets twice daily

The usual half gramme tablets were used.

The best way to give the drug to infants is to suspend it powdered in 2 or 3 c.c. of milk and insert it into the mouth with an eye dropper. An alternative way is to make it into a paste and insert it into the child's mouth on the end of one's finger.

In order to follow the bacteriological progress of each case smears from the conjunctival discharge stained by Gram's method were examined before treatment commenced and thereafter at regular intervals. Cultures were made at first but were found to be unnecessary.

The authors give a description of their experiments and of the bacteriological effects on acute conjunctival inflammations caused by the Koch-Weeks bacillus and by the gonococcus and on mixed infections by these organisms when treated with sulphapyridine, sulphathiazole or sulphadiazine. These may be summarised as follows:—

1. A single dose of sulphapyridine cured nearly 60 per cent. Two doses are not noticeably more effective than a single dose; being toxic four doses were not given.

2. Two doses of sulphthiazole were not sufficient to cure all cases but four doses resulted in 100 per cent. cures.

3. Two doses of sulphadiazine did not cure all cases but four doses resulted in 100 per cent. cures.

After a single dose of any one of the sulphonamides there is a lag period of about four hours before bacteriostasis begins, but this lasts for about 12 hours. The authors found that sulphadiazine was less toxic than sulphathiazole and acted with greater rapidity. In the clinical signs there is always a time lag behind the bacteriological findings, for although the smears may be negative in 9 hours it takes from 24 hours to three days to complete the clinical cure. They consider treatment during two days by means of four doses is ample.

Penicillin. Given intramuscularly penicillin is highly potent in gonococcal ophthalmia but repeated injections over at least two days are necessary to obtain a complete cure. It has no advantage over sulphadiazine or sulphathiazole. It is without the slightest benefit in Koch-Weeks conjunctivitis.

Topical applications were tried, a most laborious business. (*Brit. Med. Jl.*, Jan. 1945, p. 107). Since Garrod has shown that there is nothing to be gained by using high concentrations the usual 500 Oxford units per c.c. were used. The response in gonococcal ophthalmia was unsatisfactory, in Koch-Weeks infection it was almost useless.

A. F. MACCALLAN.

NOTES

Honours

THE Honorary Membership of the Ophthalmological Society of the United Kingdom has been awarded by the Council to :—
Dr. Arnold Knapp; Sir John Parsons; Professor G. Rönne; Dr. A. H. H. Sinclair; Dr. Derrick Vail.

Sir Stewart Duke-Elder was elected Honorary Fellow of the American Medical Association at its Summer meeting held in San Francisco in July, 1946.

The Honorary DSc. of the North Western University, Chicago, was conferred upon him.

Mr. F. A. Williamson-Noble has been appointed Master of the Oxford Ophthalmological Congress, 1947.

The Société Belge d'Ophtalmologie bestowed Honorary Membership on Mr. Frank Law at their Congress in Brussels on September 28, and presented him with the van Duyse Medal.

The Council of the Royal College of Surgeons of England have elected Mr. B. W. Rycroft, O.B.E., to a Leverhulme Scholarship for research in the surgery of corneal grafts in this country and abroad.

Appointment

MR. J. H. DOGGART has been appointed Ophthalmic Surgeon to St. George's Hospital.

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Oxford Ophthalmological Congress Officers 1946-47

President, F. A. Williamson-Noble; *Deputy Master, Hon. Sec. and Hon. Treasurer*, F. A. Anderson; *University Representative*, Professor Ida Mann.

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Royal Society of Medicine, Section of Ophthalmology Officers and Council for Session 1946-47

President, A. Harold Levy; *Immediate Past-President*, P. E. H. Adams; *Vice-Presidents*, Sir Stewart Duke-Elder, F. W. Law, Air Commodore P. C. Livingston, A. B. Nutt, J. D. Magor Cardell, Charles Goulden, O.B.E., John Marshall; *Honorary Secretaries*, P. M. Moffatt, A. Seymour Philps; *Other Members of Council:—Physicians*, R. Wyburn-Mason; Harvey Jackson, Macdonald Critchley; *Metropolitan Members*, J. G. Milner, H. B. Stallard, M.B.E., H. M. Joseph, A. J. B. Goldsmith, Mary A. Pugh, B. W. Rycroft, O.B.E., Arthur Lister, Hon. G. J. O. Bridgeman, M.C., Victor Purvis; *Provincial Members*, Lt.-Col. R. E. Wright, C.I.E., E. G. Recordon, Dorothy R. Campbell, J. P. Lloyd, G. T. Willoughby Cashell, G. I. Scott; *Representative on Library Committee*; Arnold Sorsby; *Representative on Editorial Committee*, E. Wolff.

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Royal Westminster Ophthalmic Hospital. Annual Report

THE 129th Annual Report of the Royal Westminster Ophthalmic Hospital (1946) follows customary lines. The Hospital escaped serious damage during the war and its doors were never closed. Eighty beds were in use on December 31, 1945. Lack of accommodation for nurses is the principal cause in delay in re-opening the other twenty beds. More nurses are now required than in pre-war days. Details of finances, legacies, etc., and the Almoner's report complete the booklet.

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